SCIENTIFIC AMERICAN

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

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

Vol. XLV.—No. 5. [NEW SERIES.] NEW YORK, JULY 30, 1881. [$3.20 per Annum. [POSTAGE PREPAID.]

NEW LASTING MACHINE.

It would be difficult to name an industry in which mechanical skill and invention have produced such marked effects as in the manufacture of shoes. The cutting of the uppers, soles, and heels, the treeing, pegging, stitching, finishing, and eyeleting, are all done by machinery, and many of the minor operations in the manufacture of shoes are accomplished by improved tools which greatly facilitate the work and cheapen the cost of manufacture. But hitherto lasting has been principally done by hand, making it a comparatively slow operation.

We give an engraving of a machine recently patented by Mr. S. B. Ellithorp, of Rochester, N. Y., for accomplishing this work with rapidity and uniformity. The machine is equally well adapted to boots and shoes, and it is so clearly shown in our engraving that any one familiar with boot and shoe machinery will be able to understand it without reference to the description.

The frame of the machine is made of the base and top pieces, connected by vertical iron rods at the corners. The plates, A, are suspended by connecting rods from levers, B, pivoted at the top of the frame, and the levers are connected with arms on the rockshafts, C, so that when the latter are partly rotated the plates will be raised or lowered more or less.

The plate, A, carries a number of adjustable hooks, E, provided with nippers or clamps, F, which grasp the edges of the uppers surrounding the lasts, G.

The machine shown in the engraving holds two lasts, and is capable of lasting two uppers simultaneously. In the present case the uppers are omitted in the first half of the apparatus to avoid confusion in referring to the different parts. Two levers, I I, are provided for each last. They are pivoted to a standard in front, and are elongated at the opposite extremity, forming handles which are brought together and retained by a link after the operation of stretching the uppers has been performed.

The lasts are held down upon their seats by screws, K, passing down through nuts in the top of the frame and bearing upon the center of the lasts.

The standards which support the last seats are made adjustable, so that they may be raised or lowered for different sizes of shoes and for boots.

The devices which hold the last render it adjustable in every direction, so that a last of any size may be used in the machine. The hooks on which the nippers are hung are capable of being adjusted, and the screw that holds the last down may be adjusted so as to press upon any part of the last.

The shafts, C, are provided with hand wheels, J, and with levers, by which they may be turned so as to bring any desired amount of strain upon the leather.

To last a boot or shoe on this machine the upper leather that has been prepared for lasting is turned bottom up and the last inserted therein bottom up, the last having an insole already tacked on the bottom. The last is then placed bottom up in the seat, so that the pin (Fig. 3) enters the corresponding hole in the last, the toe of the last resting in a curved seat, supported by the adjustable standard. The plate, A, is then lowered to the full extent, and the clamps, F, are adjusted so as to grasp the upper leather all around the edge, first grasping at the center at the heel, then at the center at the toe, and then, at proper distances apart, all around the upper. The holding bolt is then forced down upon the last, holding the last firmly down on the seat. The plate, A, is then drawn up by turning the shaft, C, pulling up the clamps, E, and consequently the upper leather, closely to the last at every point alike. The last being firmly held down, all the surplus leather of the upper leather is then above the bottom of the last. The levers, I, are now closed, pressing the upper leather to the shape of the last all around the bottom about the insole.

A gathering cord is then placed about the upper leather and drawn tight. The cord is again pulled and secured, and the boot or shoe is then lasted ready for tacking, which may be done in the machine while the last rests on the seat on opening the levers; or the boot or shoe may be removed and then tacked.

It has been supposed by some that there were mechanical obstacles that rendered it impossible to last boots or shoes by machinery. Such obstacles, if there were any, have been successfully overcome by this invention, by which boots or shoes of all grades of stock may be lasted in a manner far superior to hand work.

This machine is simple and easy to operate; a girl or boy can operate it and do better work than is usually done by hand.

To produce a handsome boot or shoe and a good fit it must be perfectly lasted; this every practical man in the trade admits; and it is equally true that not one pair in ten is properly lasted.

The inventor says that with this machine it is hardly possible to last a boot or shoe imperfectly. It will do perfect work with all kinds of stock, and it may be operated by hand or power.

Further information in regard to this useful invention may be obtained by addressing the inventor as above.

Fig. 2.

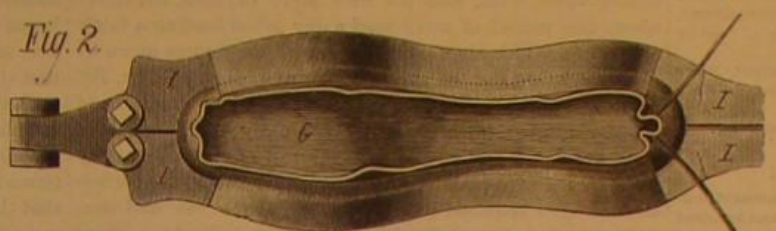
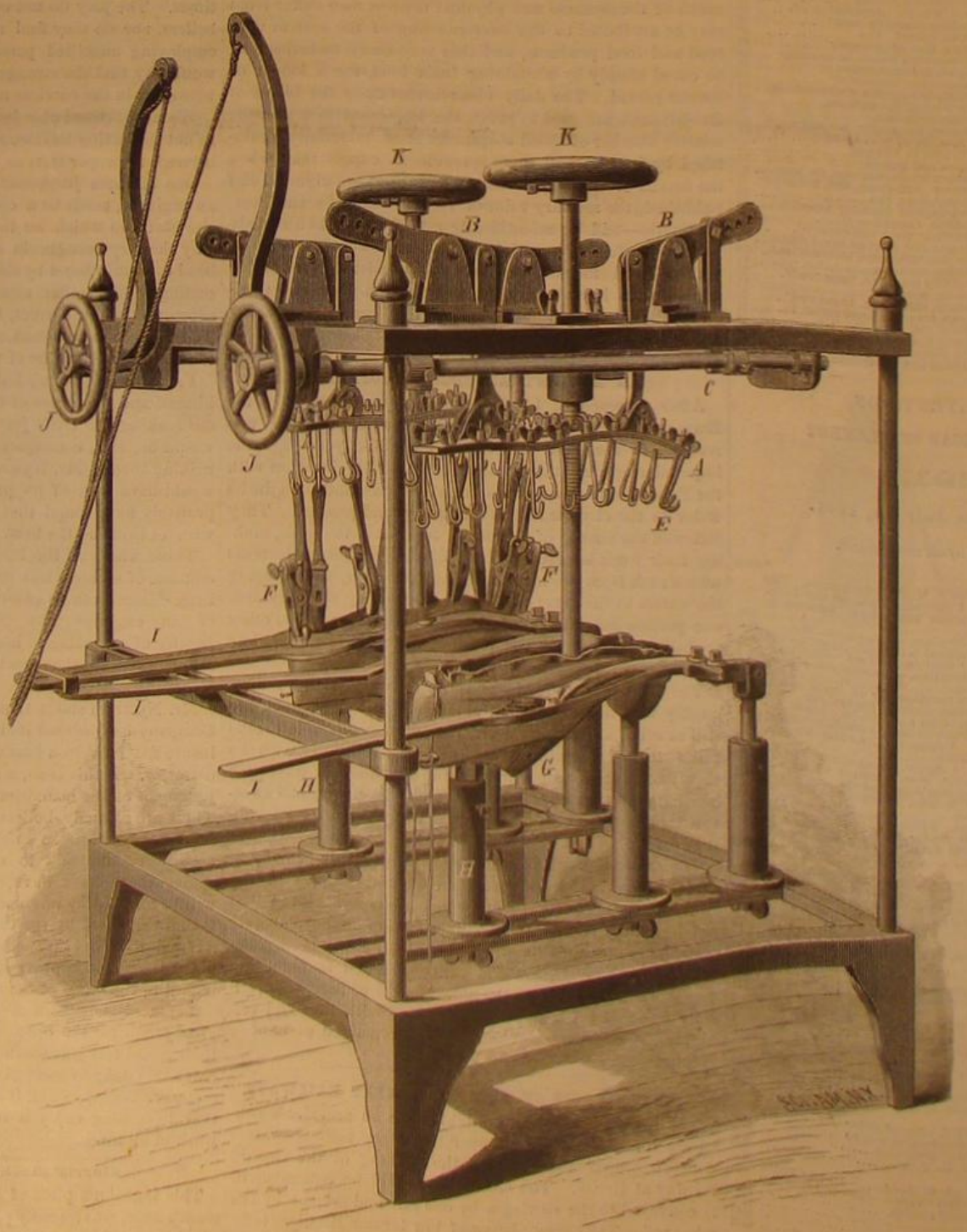


Fig. 3.

LASTING MACHINE—PLAN AND SECTION OF LAST.



ELLITHORP'S BOOT AND SHOE LASTING MACHINE.

The Division of the Comet Doubted.

Owing to the persistent bad weather and the rapid retreat of the comet into space it is to be feared that the question of the comet's spontaneous division on the night of July 6, as reported by Professors Stone and Wilson, at Cincinnati, will not be satisfactorily settled. The astronomers of the observatory at Washington saw a great disturbance in the coma about the nucleus of the comet the same night, and a partial separation, which might appear as a complete division in the less powerful glass employed at Cincinnati. Other astronomers are confident that no division of the nucleus occurred.

Unfortunately, as already noticed, the atmosphere has since been very unfavorable for such observations, and the question threatens to go undecided until the comet comes back again—if it ever returns.

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.

Remit by postal order. Address

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

The Scientific American Supplement

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

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

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

Scientific American Export Edition.

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

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

NEW YORK, SATURDAY, JULY 30, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

American osprey, the home of.... 71
American Philological Society.... 68
Ants, curious observations on ... 71
Aqueduct, ancient, reopened..... 64
Band saw machine, new*..... 67
Battery, Maiche's*..... 68
Binding, cheap, for Sci. Am..... 65
Boiler explosion, Gaffney..... 64
Boiler heads, cast iron, flat..... 69
Brakemen, mortality of..... 67
Brass, naval..... 72
Canceling stamp, improved*..... 67
Cast iron boiler heads*..... 65
Chesapeake Bay lighthouse, new, 67
Chilcat meteor..... 70
Comet, division of the, doubted.. 63
Comet, great, of 1881, views of*... 69
Comet 2, 1881, early obs. of..... 69
Copper, iridescent..... 70
Copying process, stencil*..... 65
Cork extractor, novel*..... 67
Cotton fair, Atlanta..... 65
Curse of poor printing, the..... 72
Dental Association, American..... 66
Dividers and calipers, improved*. 67
Division of the comet doubted.... 63
Drainage system, Florida..... 69
Fast, Dr. Griscom's..... 64
Food and drugs, examination of.. 72
Fruit, fresh, transportation of.... 69
Gaffney boiler explosion..... 64
Glycerin..... 70
Griscom's (Dr.) fast..... 64
Gun stock, adjustable, new*..... 65
Heating effects due to compres'on 72
Induction balance, new use for*.. 66
Inventions, mechanical..... 73
Inventions, miscellaneous..... 69
Inventions, recent..... 66
Iron, tinned, preparation of..... 68
Lasting machine, new*..... 63
Laws, patent, the..... 68
Laws, the, of property..... 68
Life-saving lesson in physics*.... 66
Light, decomposition of..... 73
Lubricator, improved*..... 70
Luminous signals, intermittent... 73
Mechanical inventions..... 73
Meteor, Chilcat..... 70
Mining, hydraulic, in California.. 72
Mortality of brakemen..... 67
Nitrates in Nevada..... 72
Notes and queries..... 74
Observations, curious, on ants.... 71
Osprey, American, the, home of*. 71
Patent laws, the..... 68
Philological Society, American... 68
Poillon, Cornelius C..... 64
Printing, poor, the curse of..... 72
Quartz and marl as wood fillers... 73
Signals, luminous, intermittent.. 73
Sitting snake, a..... 71
Slotting machine, improved*..... 70
Snake, sitting, a..... 71
Stamp, canceling, improved*..... 67
Steel, temp. of least resist. in.... 71
Street railways, electric..... 64
Tin in the Sierra Madre, Cal..... 67
Tin plate..... 68
Tinned iron, preparation of..... 68

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 291,

For the Week ending July 30, 1881.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—H. M. S. Polyphemus. The torpedo ram for the British Navy. 3 figures. View of the Polyphemus. Bow view, showing hull below water line. Launch at Chatham Dockyard 4631
The Polyphemus. Construction.—Engines.—Armament, etc. 4631
The Canal system of New York. Samuel McElroy's paper before the Western Society of Engineers. Canal projections.—Engineering.—Original engineer corps.—Construction.—Dimensions.—Operations 4632
The Bollee Steam Carriage. A new carriage for common roads. 4 figures. Passenger carriage.—Traction carriage for freight 4633
Annular Wheels. Forms of epicycloidal and involute teeth for inside gear.—Failure of the odontograph to meet certain practical tests. By Prof. C. W. MACCORD. 6 figures. Annular wheels. Forms of epicycloidal and involute teeth..... 4634
The Old Aqueducts of Paris. 1 figure. Aqueduct of La Vanne over the Valley of the Bievre, with remains of an old Roman aqueduct and the aqueduct of Marie de Medicis. 4637
Farquhar's Filtering Apparatus. 8 figures. Sections to scale of various parts of Farquhar's apparatus. 4637
Suggestions about Stuffing Cushions. 2 figures. 4638
On Harvesting Machinery. By E. SANDERSON. Mowing machines.—Cutting apparatus.—General features of design.—Rack delivery reapers..... 4643

II. ELECTRICITY, LIGHT, HEAT, ETC.—Heat in Relation to Chemical Action. By HENRY ALLEN. Recent advances in thermo-chemistry.—M. Berthelot's calorimetric apparatus.—Principles of chemical mechanics.—Application of the principles of maximum work 4638
A Simple Equatorial. 1 figure 4640
Voss's Induction Electrical Machine. 1 figure. The Voss-Holtz Electric Machine..... 4641
The Pressure of Wind..... 4641
Hylozoic Materialism. By ROBERT LEWINS, M.D. 4641
Theory of Thermo-Electric Motive Forces. By M. PILLEUR..... 4642

III. HYGIENE AND MEDICINE.—The Chemical and Physical Effects of Fillings upon Teeth. By CHARLES MAYR.—The chemistry of albumen.—Chemical complexity of tooth substance.—Kinds of fillings.—Effects of fillings.—Mechanical effects.—Thermal effects.—Chemical effects.—Electrical effects.—Gold the worst filling in most cases 4642
Rheumatism. Dr. M. P. GREENWOOD..... 4643
Modification of Anæsthetic Methods..... 4643

IV. TECHNOLOGY AND CHEMISTRY.—Disinfection by Nitrous Oxides. 2 figures.—Apparatus for disinfecting vaults 4646
Tanning. By K. SADLOW.—Patented processes..... 4646
Cane Sugar from Molasses. By U. GAYON..... 4646

V. NATURAL HISTORY.—Jottings about Snakes. By ARTHUR STRADLING.—Use of the snake's forked tongue.—How to tame shy animals.—Taming influence of friendly speech..... 4640
Fossil Saiga Antelopes 4645
Natural History of Butterflies 4645
Land Snails.—Fossil species..... 4646

VI. AGRICULTURE, ETC.—Saddle Horses.—Special requirements and special breeding necessary 4644
To Keep Very Shaded Places Green 4644
Ensilage.—A caustic criticism of Dr. Bailey's claims..... 4644

DR. GRISCOM'S FAST.

At noon, July 12, Dr. John A. Griscom completed, at Chicago, a self-imposed fast of forty-five days. During the fast he drank 1,433 ounces of water, or about two pounds a day. When he began he was in fine physical condition and weighed 197¼ pounds. At the close of the fast he weighed 147½ pounds; his pulse was 66, respiration 15, temperature 98° Fah. On the first day of his fast his pulse was 84, and his temperature 100°. He suffered but little during the fast, and his strength held out wonderfully. To the last his muscular power exceeded that of most men, and his mind was perfectly clear.

The faster was watched by a number of reputable physicians, and a scientific record of his condition was kept from day to day. The official summary of the record, it is promised, will add materially to the physiology of fasting, while certain of the results are said to be fatal to some of the accepted theories of medical men.

It will be observed that—if the evidence of Dr. Griscom's case holds generally—a man in good physical condition, subsisting upon water and his own store of flesh, consumes about one pound of solid food a day when leading a fairly active life. This closely coincides with the figures given by physiologists. For an average man at ordinary labor, Dr. Letheby estimates, on the experiments and observations of a large number of investigations, a daily requirement of 5·688 grains of carbon and 307 grains of nitrogen, or nearly six-sevenths of a pound; while, for active labor, the carbon and nitrogen required weigh together about one and one-fifth pounds. Dr. Dalton's observations indicate a more liberal diet as necessary for a man in full health taking free exercise, his quantities being equivalent to 16 oz. meat, 19 oz. bread, 3½ oz. butter—or nearly 2½ pounds of mixed food, and about three pints of water.

It would seem from these figures that the absorption of food from one's own bodily store of flesh costs considerably less energy than the digestion and assimilation of food in the usual way. In any case, a man in good health, with fifty pounds of surplus flesh, can safely reckon on nearly as many days of life, in case of enforced abstinence, or for voluntary abstinence, as for the cure of disease.

The purpose of Dr. Griscom's fast, he says, was to impress people with the utility of fasting and the possibility of long-continued fasting without severe pain. He believes that much of the sickness and physical distress men suffer from may be attributed to the overcrowding of the system with food and food products, and that very many maladies may be cured simply by abstaining from food for a longer or shorter period. The daily observations upon the blood of Dr. Griscom are said to prove the important fact that the relative number of blood corpuscles is not materially diminished by fasting; and there is reason to expect that, when the details of the physicians' observations are digested and published, the sanitary value of fasting—and of eating less, habitually—will be scientifically established. As a remedy for obesity, fasting—partial or complete—would seem to be both safe and efficient; but it must be persisted in for longer periods than have heretofore been thought prudent. Curiously, the distress of hunger seems to vanish after a few days' abstinence.

AN ANCIENT AQUEDUCT REOPENED.

After a breach of 1,600 years the aqueduct built by the Emperor Augustus to supply Bologna with water was restored to use June 5. Nineteen hundred years ago the imperial engineers tapped the Setta near its junction with the Reno, about eleven miles from Bologna, and brought its water to the city through an underground passage. They followed the course of the Reno, tunneling the hills, sinking their work beneath the beds of the precipitous torrents which rush from the mountains into the river, and bringing the waters to the gates of the city, where they were divided, one portion going to supply the public baths, and the other probably destined for the fountains of streets and public squares.

The work of tunneling and the masonry were so thoroughly well done that both stonework and brickwork are still as solid as the rock itself, the only considerable breaks being where the turbulent Reno had washed away with its clayey banks several portions of the aqueduct, or where the headlong torrents which rush down into its stream had excavated their own beds and carried away the artificial substructure.

The restoration of this important work is due chiefly to Count Gozzadini, who caused an accurate survey of the aqueduct to be made about twenty years ago, and in 1864 published the results of the investigation in an elaborate memoir. Since then the work of restoration has been going on with a thoroughness and skill calculated to make the new work as enduring as the old. The aqueduct was originally made of brick and stone cemented with lime and volcanic sand, and the unbroken portions remained as hard as granite.

INCONVENIENCES OF ELECTRIC STREET RAILWAYS.

The hope that electricity might prove an acceptable substitute for horse power in operating street railways meets with an unexpected rebuff in the working of the electric railway at Berlin. The electricity, it will be remembered, is conveyed to the carriages by one rail and returns by the other rail. The current being of low tension the electricity does not leave the track except when connection is made between the two rails. Accordingly, either rail may be safely touched, stepped on, or walked on by men or animals. But when both rails are touched at the same time, as easily happens when a horse crosses the track, an unpleasant if not dangerous shock is received. Where the Berlin road crosses wagon roads at grade it has been necessary to make a special arrangement to avoid this difficulty by putting one rail out of circuit and connecting the adjoining rails electrically by means of a covered conductor. For elevated or for depressed roads this objection does not hold; and the electric railway promises to fill a wide field of usefulness in such connections.

THE GAFFNEY BOILER EXPLOSION.

This accident, which took place June 1, was very fully illustrated and described in the SCIENTIFIC AMERICAN, July 2. On that occasion we commented upon the erroneous nature of the verdict rendered by the coroner's jury, which reads as follows:

"The inquest appointed to inquire as to the causes of the deaths of F. C. Harbeson, Frederick Dusher, and Robert Bradley, on June 1, 1881, find that they came to their deaths by an explosion of a boiler at the dye works of Gaffney & Co., situated on Collins street, opposite Tucker street, and that the explosion was due to the improper use of cast iron in the flat head of the boiler. We also find that no skilled attendant was employed to care for the boilers, and that the attendant performed other duties that withdrew him at times from the care of the boilers. The inquest consider that the Hartford Boiler Inspection and Insurance Company are especially censurable for the incompetence and negligence of its agents who inspected and certified to the safety of this boiler, and they urgently recommend that the proper authorities take measures to prevent the recurrence of disaster so terrible in its results."

In the course of our remarks we called attention to the fact that the steam stop-valves were found, after the explosion, to have been shut; and we suggested that this closure of valves and the probable inoperation of the safety valves produced an over-pressure of steam—it being the dinner hour—which resulted in the bursting of the boiler.

It will be noticed that the jury find that no skilled or licensed attendant was employed to care for the boilers; and that the inexperienced person who fired them had other work to perform that took him away from the boilers at times. The jury do not condemn this method of running boilers, nor do they find any fault with the proprietors for employing unskilled persons. Most engineers, we think, would say that the strongest boiler in the world might burst when run in the careless manner certified to by this jury.

We also blamed the jury for neglecting their plain duty in not subjecting the two remaining boilers, which were uninjured, to proper tests as to strength.

One of these jurymen, Mr. Nystrom, who assumes to be an engineer, sends us a communication, which we publish elsewhere, in which he throws new light upon the reasons why the jury brought in this verdict. He says "the boiler head evidently burst by shrinkage or expansion strain in the casting." The other members of the jury appear to have accepted this as correct, but it looks to us as erroneous. They appear to have had no data, and made no experiments to determine the value of this opinion.

From Mr. Nystrom's letter it would also seem that both himself and the others of the jury were fully satisfied without making the trials just what the results of such tests would be; and, consequently, did not go to the trouble of making them. Mr. Nystrom says: "Such an experiment would have been of no practical use, for the jury would probably have found that the shell of the boiler bursted without injuring the head."

Those who read the interesting report given in another column, of a recent test, such as we suggested, will see how little reliance can be placed upon the books or the opinions of an engineer like Mr. Nystrom, who had the easy faculty of appealing to his own imagination for information rather than to the practical teachings of actual experiment.

Mr. Nystrom states that the Hartford Boiler Insurance Company has ordered its inspectors in Philadelphia not to insure flat cast iron headed boilers over thirty inches in diameter. If this is so, we shall have less respect for the judgment of the managers of that company than heretofore. There are so many boilers now running having flat cast heads, they work so safely and so well, that it seems absurd for anybody to undertake any crusade of alarm against them. We have no expectation that boiler-owners will be affected by any such proceedings. The true position is that expressed by the City Solicitor of Philadelphia, who advised the City Inspector, when, in his judgment, a boiler is safe, to approve it and give a certificate, without regard to the mode of construction.

Messrs. Sidebotham & Powell are certainly entitled to great credit for the open and impartial manner in which their recent test was conducted. It is but an example of the pains they take to ascertain the value and strength of the materials they use; and it will add to the high reputation they have long enjoyed for superior excellence in boiler work of all kinds.

Harris' Mechanical Movement.

This ingenious piece of mechanism, described in our last week's issue, was recently patented by Mr. Joseph Harris, Jr., of Harrison Square, Boston, Mass. By some mistake we omitted the inventor's address in the article referred to.

STENCIL COPYING PROCESS.

By the following process one thousand or more copies of writings or drawings may be obtained with the gelatine tablet.

Fine linen or bank-note paper is coated over on one side by means of a camel-hair varnish brush, with a clear solution of one ounce of pine resin in four ounces of absolute alcohol. When this coat has dried another is put on.

The ink used on this prepared paper is prepared from—

Water	1 ounce.
Caustic potash	1 "
Vandyke brown, to color	q. s.

The writings or drawings are executed with an ordinary pen on the coated side of the paper. The paper is then floated on the surface of clear water, written side up, with care to avoid wetting the upper side. In about ten minutes the lines will appear swollen, and then the paper is taken out by one corner and placed, writing downward, on a blotter. The back of the paper having been washed over with a camel-hair brush filled with water, the paper is turned on the blotter and washed in a similar manner until the ink disappears; the sheet is then dried between blotters, when it is ready for use.

The tablet composition is prepared by dissolving by aid of heat over a salt water bath one ounce of Cooper's gelatine, previously softened by soaking it in a little cold water over night, in six ounces of best glycerine, and pouring the solution out in a shallow tin pan. This pan may be half an inch deep, ten inches wide, and fourteen inches long. When the composition is poured in it should stand level, and should remain in this position for twelve hours. The surface of the tablet should be sponged over with cold water and dried before using.

Place the stencil paper, written side down, smoothly upon the tablet, and with a small paste brush paint over the back of the paper with an ink prepared from—

Aniline violet, best	1 ounce,
Glycerine, pure	1 "

by triturating them together in a hot mortar and allowing the ink to stand for twelve hours or more before using it.

Place over the inked sheet another (blank) sheet of the prepared paper, rub the hand firmly over it, and put a weight of two or three pounds on it; a book or smooth board with a quantity of printing paper beneath it does very well.

In about half an hour this weight may be removed and the stencil paper carefully separated from the tablet, leaving a strip of half an inch of it adhering at the side and turning the sheet over the edge of the pan, as shown in the illustration.

If the manipulations have been properly conducted a reversed copy, in the aniline ink, will be found on the tablet, and from this a large number of positive copies may be obtained in the usual manner—by spreading a blank sheet of paper on the tablet and passing the hand gently over the paper.

When the print becomes faint the stencil may be folded over and pressed against the tablet as before, the adhesion of the edge of this stencil securing, with a little care, proper registration and the rubbing re-enforcing the transfer. A few minutes is all that is required for this re-enforcing.

STENCIL COPYING TABLET.

The stencil should be turned back on a cardboard, keeping the blank sheet under it.

This stencil paper is semi-translucent, so that in copying drawings, wood engravings, etc., it may be used as a tracing paper.

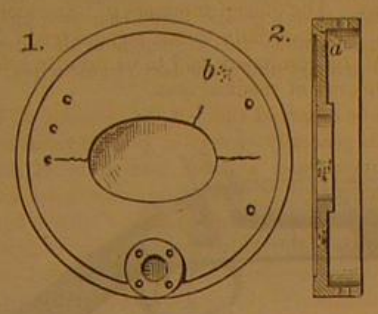
In floating the stencil on the water care should be taken that no air bubbles are left under the paper.

INTERESTING TEST OF CAST IRON BOILER HEADS.

Messrs. Sidebotham & Powell, proprietors of the Frankford Boiler Works, in Philadelphia, the firm who made the exploded Gaffney & Co. boiler, that was illustrated in the SCIENTIFIC AMERICAN of July 9, 1881, having been censured by certain local experts for having made a poor boiler for Gaffney & Co.—hence the explosion—determined to test a short model section made in the same manner by bursting it with hydrostatic pressure.

The experiment was made on the afternoon of July 13, at their works, Frankford Road, in the presence of a large number of invited mechanics, manufacturers, and experts, among whom were inspectors of the city and of the Hartford Insurance Company, and nearly all the coroner's jury whose late verdict made such a sensation in Philadelphia, on account of its virtual condemnation of flat cast iron heads

The tested boiler was composed of a single plate of No. 3 boiler iron of the best quality, single riveted, in the form of a hollow cylinder, 42 inches long by 36 inches diameter, having two flat cast iron heads, one of which had the same sized man hole and the identical plate that blew out of the Gaffney & Co. boiler. The number and size of the holes were the same as in the exploded boiler head, which was cast from the same pattern. A hand pump used by the city inspectors was used to force in water. In addition to the holes that were in the exploded head one was made at *b* and a plug inserted to stop a leak. When the pressure reached 450 pounds per square inch the head having the man hole gave out, without noise or shock, by cracking on lines each side of the man hole opening on the large axis of the oval six inches each way, and another radial crack about two inches long at the upper right hand curve, thus:



The head was then taken out after unsuccessful attempts had been made to complete the breaking of it by sledges, and an examination of the inside showed a circular crack near the angle of the flange at *a*, extending one-third or more round the circle. The breaking up of the casting was then completed to compare the texture of the metal with that of the old head, which was at hand for the purpose.

The result indicates that cast iron has still some reliability as a material for boiler heads. This sample that gave out was not more perfect than the Gaffney head; in fact it showed pin-hole leaks at *b*, Fig. 1, when the pressure reached about 200 pounds, and a number of defects were seen in the circular fracture. The outward deflection of the unbroken head at the other end of the cylinder was noted and found to be three-sixteenths of an inch outward bulging at the center.

This test was, in the minds of all unprejudiced persons who saw it, a complete vindication of Messrs. Sidebotham & Powell, and goes to show that both their work and their judgment were good. The ultimate strength of the weakest part of this experimental boiler being 450 pounds, the rule that allows a factor of one-fifth would give 90 pounds as the safe working load for it. The whole indicates that the pressure on the Gaffney boiler was something enormous at the time of the explosion, as no shock is believed to have taken place.

The Philadelphia *Record* gives the following particulars:

"When everything was in readiness the pressure was applied. The usual seeping at the rivets was apparent when the gauge registered 105 pounds, but beyond this the boiler did not exhibit any symptoms of a strain. At 130 pounds the water began to ooze through a small sand-hole in the head, above the man-hole, showing that the head was slightly defective. The pressure was then reduced, while Inspector Overn affixed a contrivance to the rear end for the purpose of measuring the extent of expansion. Pressure was again applied until the gauge marked 140 pounds, then 160, 180, and 200. At this moment of pressure the seams on the side of the boiler began to weaken, and from one spot a spray of water as fine as steam was discharged. At 250 pounds this had increased to a good-sized squirt, and at 350 the water was issuing with such force as to be thrown four feet away. Still the heads remained intact. At 400 pounds half a dozen similar fissures appeared in a close row in the same seam. The pressure was then gradually increased to 425 pounds, and the lookers on were beginning to wonder whether the boiler would hold out forever, when a sudden crack was heard in the front head, and the water commenced to run down from a fissure extending half way across the head. The gauge showed that the boiler had given out at a pressure of 450 pounds. Had it not been for defects, the head would probably have stood an additional 50 pounds pressure before giving way. The measurements taken by Inspector Overn showed that the rear head had expanded one-sixteenth of an inch at 200 pounds, and three-sixteenths at the time of the break.

"The members of the Coroner's jury had little to say concerning the result. Three of the five sat some distance away while the pressure was being applied, and apparently took but little interest in the proceedings. Before leaving they held a short confidental consultation, in the course of which one remarked: 'This is no reflection on us. If we undertake to answer it we shall never be done of the subject.' 'Yes,' responded another, 'we would start a discussion which would never end.' Several of the jurymen, when asked to give their opinion of the experiment, emphatically declined to express themselves on the subject.

"Several weeks ago, when the Hartford Company decided not to pass any boilers with flat cast-iron heads over 32 inches in diameter, City Inspecter Overn addressed a communication to City Solicitor West, asking what authority, if any, the City Inspector could exercise in the same direction, and also requesting advice as to how he should govern himself in passing upon steam boilers. In reply, the City Solicitor says that the questions are more fitted for a mechanical expert than for a lawyer, but that legally he would advise the inspector when, in his judgment a boiler is safe, to approve it and give a certificate, without regard to its mode of construction or the material used. Mr. Overn has consequently decided to adhere to his usual practice of passing all boilers with the obnoxious heads if they have safely withstood the cold water test."

The American Institute and the Atlanta Cotton Fair.

To facilitate the transportation and care of exhibits from this region for the Atlanta International Cotton Exposition, the Board of Managers at Atlanta have authorized a committee of the Farmers' Club of the American Institute to arrange for a "collective exhibit" comprising a variety of subjects. This gives to manufacturers and others who do not care to go to the expense of making an individual exhibit to have their goods shown there at a nominal expense.

The committee will meet at the Cooper Union every Tuesday at 1:30 P.M., and the members may be consulted at their respective addresses as below:

J. M. Jones, Chairman, 48 South Oxford St., Brooklyn; Dr. I. P. Trimble, Entomologist, 15 West 31st St., New York; Prof. A. R. Ledoux, 17 Cedar St., New York; Dr. A. S. Heath, Pres. Farmers' Club, 945 Lexington Ave., New York; N. S. Bailey, Secretary, 192 Water Street, New York.

It is desired that all applications be made by August 10, that ample space may be secured. The exposition opens Oct. 5, and closes Dec. 31, 1881.

A LIFE-SAVING LESSON IN PHYSICS.

It is a well-known fact that any person of average structure and lung capacity will float securely in water if care is taken to keep the hands and arms submerged and the lungs full of air. Yet in most cases people who are not swimmers immediately raise their hands above their head and scream the moment they find themselves in deep water. The folly of such action can be impressively illustrated by means of a half empty bottle and a couple of nails; and the experiment should be repeated in every household until all the members —particularly the women and children—realize that the only chance for safety in deep water lies in keeping the hands under and the mouth shut.

Any short-necked, square-shouldered bottle will answer, and the nails can be easily kept in place by a rubber band or a string. First ballast the bottle with sand, so that it will just float with the nails pointing downward, as shown in Fig. 1; then by turning the arms upward, as shown in Fig. 2, the bottle will be either forced under water at once or will be tipped over so that the water will pour into the open mouth, and down it will go. To children the experiment is a very impressive one and the moral of it is easily understood.

The vital value of this precaution was strikingly illustrated near Accomac C. H., Virginia, a few days ago. A niece of the Hon. John Neely, while bathing, was swept off into the ocean by a strong current and soon disappeared in the high breakers. As she could not swim her companions gave her up for lost. Two young fishermen who were employed some distance away thoughtfully set out with a small boat in search of her, and, when a mile or more from shore,

found her floating on the water. She had been drifting nearly an hour and was greatly exhausted, but soon recovered. Unable to swim she had pluckily floated, thereby making her rescue possible.

A Cheap Binding for the Scientific American.

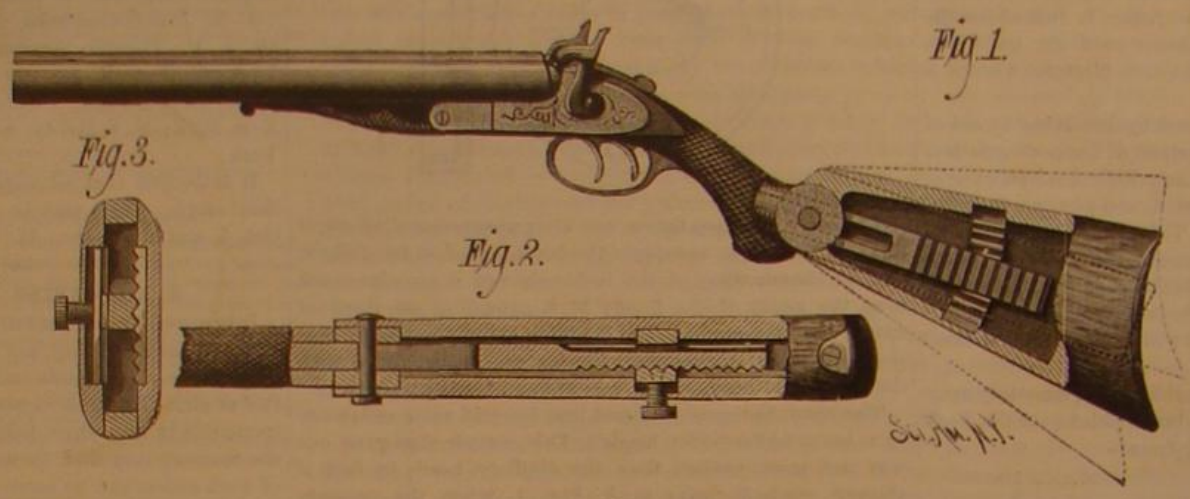
A correspondent says:

I have bound about twenty volumes in this way: Pack the papers smoothly; hold firmly, and drive a thin chisel through the pile about half an inch from the back. Push strong tape through and leave out about two inches; put three or four tapes through at even intervals. Cut common thick paper boards large enough to project a little everywhere except that one edge must come front of the tapes. Draw the tapes tightly and *glue* down to the boards outside. Skive a piece of leather—common sheepskin will answer—wide enough to cover the back and come on the boards an inch or two, and long enough to project a couple of inches at the end. Paste the leather well, put it on the back; fold the ends in so as to come over the boards on each side. Paste any fancy or plain paper over the sides; and, lastly, paste the blank leaf down to the cover inside, and you have a very presentable book and very durable. Trimming the edges is not very essential, as the SCIENTIFIC AMERICAN is now trimmed, but that can be done by clamping between boards, and cutting the edges with a thin sharp knife by a straight edge. Of course this is done before the boards are put on after the tapes are in. This makes a flat edge book, but for a thin book answers very well. S. H. B.

NEW ADJUSTABLE GUN STOCK.

The engraving represents an improvement in gun stocks recently patented by Messrs. A. Hape and A. S. Oliver, of Elberton, Elbert county, Ga. This stock can be adjusted to any desired inclination, and it may be lengthened or shortened as may be required. Figure 1 is a side view of a stock showing different positions in dotted lines; Figure 2 is a horizontal section showing the relation of internal parts, and Figure 3 is a vertical transverse section.

A slotted extension projects from the end of the grip, and enters the hollow stock. At the smaller end of the stock there is a joint which slides upon the extension, and is capable of being fastened at any desired point. The extension has upon one of its sides longitudinal ribs which are engaged by a ribbed sector embedded in the stock, and serve to adjust the angle of the stock by placing the ribbed extension at different points on the sector. Upon the other side of the stock there is a ribbed plate which is the counterpart of the transversely ribbed surface of the extension. This plate is clamped tightly against the extension by a screw whose head is outside of the stock. By loosening this screw the stock may be extended or moved up or down as circumstances may require, adapting the gun to the tastes or necessities of the user.



ADJUSTABLE GUN STOCK.

American Dental Association.

The twenty-first annual convention of the American Dental Association began in this city July 12. The seventy-five delegates present included many of the more prominent dentists of the country. In his address Professor C. N. Pierce, of Philadelphia, discussed the professional and legal standing of the science of dentistry, its recent advances and prospects, and the need of fuller medical education on the part of dentists. He regretted that the medical profession had never appreciated the requirements of dentists, and that the medical colleges granted degrees in dentistry without insisting on a sufficient study of general medicine. The obstetrician and the surgeon were compelled to take a full course of medicine, and receive the degree of M.D., before they could be recognized in any of the specialties. He thought that the practice of dentistry required just as careful an education as the branches of medicine did, and therefore inferred that the medical profession should give the subject more attention.

A NEW USE FOR THE INDUCTION BALANCE.

BY GEO. M. HOPKINS.

The form of induction balance devised by Professor Hughes, of London, already has several interesting and useful applications, and a new use for it is now suggested by the recent tragedy at Washington. It seems essential to locate the bullet in the body of the President.

The induction balance is a most delicate electrical instrument for detecting the presence of metals, and a modified form of it could be easily applied to this purpose with a reasonable expectation of success. This instrument consists of two short glass cylinders, around each of which are wound two parallel coils of fine insulated copper wire. One coil of each pair is included in a battery circuit in which there is a clock microphone. The other pair is placed in a closed circuit with a receiving telephone. The two glass cylinders, with their encircling coils, may be widely separated. The induction set up in the secondary or telephone circuit is balanced by the reversal of one of the secondary coils and so adjusted that the induction in one of the secondary coils exactly balances or neutralizes the induction in the other, so that when the ear is applied to the receiving telephone no sound is heard.

Now by placing ever so small a piece of metal in one of the glass cylinders the electrical balance is disturbed and the clock on the microphone is heard to tick loudly, thus indicating the presence of metal—and the same is true if the coil be placed in the vicinity of a piece of metal.

It occurred to me to try the effect of a lead bullet upon the instrument, placing it at different distances and separating it from the coil by insulating material, but I found that the ordinary microphone with carbon electrodes was entirely useless, inasmuch as a very strong current is required to get results from lead, which of all metals, unfortunately, produces the least effect on the instrument. As a strong current burned the carbon of the microphone, I devised a current interrupter operated by a clock which interrupted the current at regular intervals and insured uniform results. With this current breaker the result exceeded my anticipations, as with a set of coils that were by no means sensitive I was able to locate the bullet with the coils raised a vertical distance of nearly two inches. I suggested to Mr. J. Stanley Brown, the President's private secretary, that, by passing a pair of coils over the President's back and abdomen, the bullet might be located, and that by making comparative tests the depth of the bullet might be ascertained.

At the request of the secretary my apparatus was sent to Washington, but nothing can be said at present in regard to the success of the experiment.

If the missile were of iron or steel no difficulty would be experienced in locating it at a depth of four to five inches, but being lead, it is questionable whether it will disturb the electrical balance at a greater depth than two inches.

The diagram shows the arrangement of battery, microphone, and primary and secondary circuit wires.

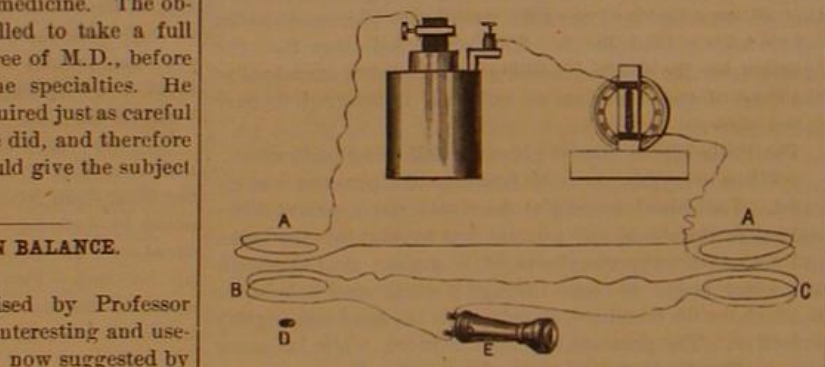


Fig. 2.—Diagram showing circuits of the induction balance.

The battery and microphone are in a closed circuit with the coils, A, A, and the coils, B, C, are in a closed circuit with the telephone receiver, E. One of the secondary coils, B, C, is reversed, so that the electrical pulsations induced in one secondary coil by one of the primary coils, A, is exactly counterbalanced or neutralized by the opposing current induced in the other secondary coil by its primary, A. Now, by placing a piece, D, of any metal in or near one of these pairs of coils the electrical balance is destroyed, and the preponderating current produces audible effects in the telephone.

Fig. 1.—THE INDUCTION BALANCE USED AS A BULLET FINDER.

RECENT INVENTIONS.

An improvement in spring-beds has been patented by Mr. Hubert Hebert, of Lake Linden, Mich. The invention consists in a spring-bed formed of a series of slats resting on crossed inclined spring-slats, the outer lower ends of which are fastened to the longitudinal side bars of a base-frame. The middle of these spring-slats is supported by two adjustable longitudinal rails passing through the middle of the base-frame, by means of which middle rails the elasticity of the spring-slats can be adjusted.

Mr. J. Paris Dunn, of Brooklyn, N. Y., has patented an improved railroad signaling mechanism. The object of this invention is to provide a device especially adapted to elevated and other railroads, where the stations are but a short distance apart, for announcing to approaching trains whether the track is clear or occupied, and thereby to prevent all collisions.

An improved package or receptacle in which granulated or lump bluing can be placed for transportation or use, has been patented by Mr. Daniel Dunscomb, of New York City. The invention consists of two hemispheres, preferably of metal, fitted to or upon each other so as to form a sphere, which is suspended so that it can rotate from a handle of wire or other suitable material that enters centrally into the upper hemisphere, and has its entered end bent or looped so as to form a stirrer for agitating the contents of the receptacle.

An improved compound for removing paint has been patented by Mr. Herman Gasser, of Platteville, Wis. The object of this invention is to provide for the use of painters or others a solvent compound for softening or dissolving old or hardened paint preparatory to washing off or removing the same from glass, wood, or other surfaces to which it may have been applied. The compound is formed of a solution of a caustic alkali with a gelatinous solution of starch.

An adjustable spur for the heel of a boot or shoe for enabling persons to walk on ice or icy surfaces without slipping, has been patented by Mr. Charles E. Friel, of Fredericton, New Brunswick, Canada. The invention consists in a spur mounted on a shaft in a recess in the heel, which can be adjusted to project through a transverse slot in the heel plate by means of a crank attached to the shaft of the spur, which shaft can be locked in any desired position by means of a notched slide fitting over this shaft and sliding on the back of the heel.

An improved gas-engine has been patented by Mr. George Wacker, of New York City. The object of the invention is to utilize the power that is obtained by the explosion of gas in a closed vessel, and to utilize the power produced by the pressure of the air on a piston at the outer end of a cylinder in which a vacuum has been formed by an explosion. The invention consists in a gas-engine having its piston-rod pivoted to a guide-rod pivoted to the frame of the machine, to which guide-rod one end of the connecting-rod is pivoted at or near the joint with the piston, whereas the other end is attached to the crank of the fly-wheel.

An improved king bolt has been patented by Mr. Horace L. Kingsley, of Racine, Wis. The construction is such that the head block and axle are not weakened by having a hole formed through them to receive the king bolt, the wear of the various parts is lessened, and the fixtures can be made and applied to the vehicle at less cost than the ordinary ones.

An improved portable head rest has been patented by Mr. Robert W. Sharp, of Brooklyn, N. Y. This head rest can be secured to any ordinary chair, and is capable of adjustment in all directions.

An improved paper bag has been patented by Mr. Charles A. S. Lockwood, of Haverstraw, N.Y. The object of this invention is to facilitate the manufacture of paper bags and economize the use of stock in their construction.

An improved lever button has been patented by Mr. Willis H. Howes, of New York city. The object of this invention is to facilitate and cheapen the construction of lever buttons. The invention consists in the combination with the hinge or joint connecting the elastic posts of the head and the shank of the shoe, of interlocking teeth, whereby the shoe will be held securely when parallel and when at right angles with the head without a separate spring.

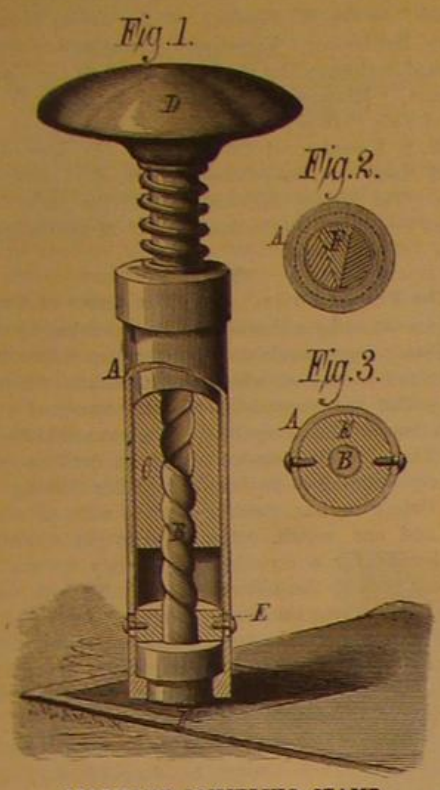
A magnetic support for scale beams has been patented by Mr. Solomon H. Brackett, of St. Johnsbury, Vt. This invention relates to beam or even balance scales, or other scales depending on pivoted levers. The main feature of this invention consists in the combination, with the pivotal beam or lever, of a magnet arranged to attract the central or pivotal part of the beam and suspend it against the action of gravity.

An improved velocipede has been patented by Mr. Alfred J. Harrison, of Parkville, Conn. The invention consists in constructing one or two of the three driving gear-wheels of a tricycle with revolving teeth, that the fixed toothed wheel or wheels geared with them may move with less friction.

IMPROVED CANCELING STAMP.

Without doubt the amount lost by the government yearly from the reuse of canceled postage stamps is enormous, and so far no adequate means of canceling stamps, so that they cannot by any possibility be used again, has been adopted by the government.

A device which will effectually cancel a stamp by abrading its surface is shown in the annexed engraving. The



GROTHAUS' CANCELING STAMP.

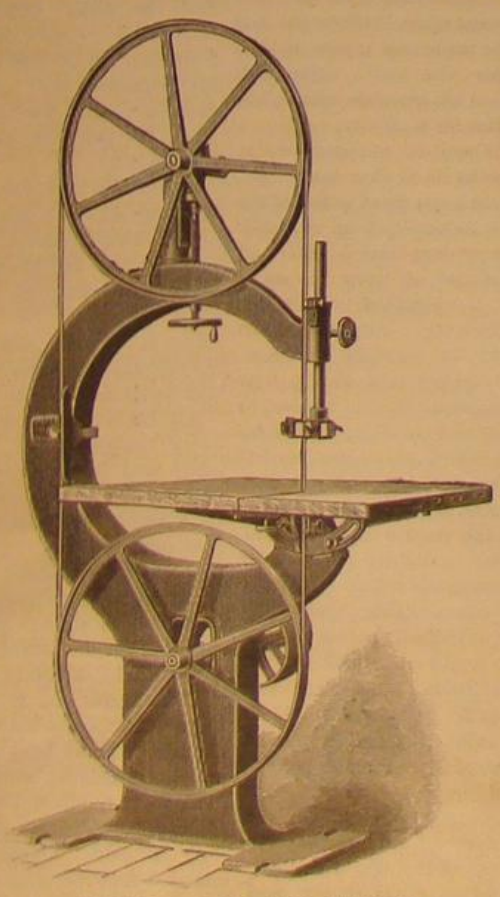
handle or body, A, of the canceler contains a sliding nut, C, which is attached to the handle, D, and receives the screw, B, attached to the revolving cutter head, E, which is retained in place by an internal flange at the bottom of the handle and by an inserted collar, E.

Between the handle, D, and the top of the case, A, there is a spiral spring which returns the parts to their normal position. The cutting head, which is shown in detail in Fig. 2, is cut like a file in different directions, so that when the head is revolved by the engagement of the nut, C, with the screw, B, the surface of the stamp is abraded, and if the canceling stamp is previously supplied with ink, the ink will be absorbed by the abraded surface, and the effects of cancellation are complete. The stamp cannot afterward be restored.

This invention was recently patented by Mr. Frederick E. Grothaus, of Borem, Texas.

NEW BAND SAW MACHINE.

This machine is new in design, and is adapted to the various requirements of a good tool of this size. The metal



CLEMENT'S BAND SAW MACHINE.

is distributed so as to obtain great strength in the arch, while the supporting parts of the frame are made comparatively light. The wheels have improved concave arms, and are carefully turned and balanced, and covered with pure rubber. The bearings are extra long on both shafts, and lined with a good quality of Babbitt metal. The upper wheel is made adjustable to strain the saw, and it is also adjustable across its axis to shift the saw upon its face; it is cushioned on the straining screw to compensate the contraction of the saw in cooling. The guides are of hardened steel, adjustable in every direction. The loose pulleys are self-oiling, and have extra long hubs. The shafts are of steel, and the table is made of kiln-dried hard wood, unless otherwise ordered, is arranged to tilt to an angle, and has the clamp bar across the slit.

This size is adapted to pattern, carpenter, bracket, toy, cabinet, carriage, and general work, and to the lighter grades of sawing in all wood shops. It will carry blades to five-eighths of an inch in width, No. 22 gauge.

Every machine is furnished with a wrench, scarfing frame for holding the saw while soldering, and with tongs for melting the solder.

This tool is a favorite among pattern-makers, and well adapted to sawing of the lighter kind.

There are four sizes of the machine made. The particular one illustrated is known as the twenty-eight inch band saw machine. We give its dimensions below:

Extreme height, 7 feet 1 inch; floor room, 3 feet 2 inches by 4 inches; table surface, 30 by 34 inches; sawing space, 10 by 28 inches; pulleys, 10 by 3¼ inches; diameter of wheels, 28⅜ inches; revolutions, 500 to 550; length of saws 16 feet; shipping weight 675 lb.

These machines, in their various sizes and with all improvements, are made by Mr. Frank H. Clement, 122 Mill street, Rochester, N. Y.

Mortality of Brakemen.

The brakemen on our railroads find it quite difficult to get their lives insured. It is estimated that there are at least ten brakemen killed throughout the country every day. The reader of the daily newspaper learns how this class of men are killed or maimed while coupling cars and making up trains, while others are knocked from the tops of cars by bridges, or slip or fall, or are injured or killed in collisions. Then there must be at least three times as many brakemen injured as are killed, of whom the public knows nothing about or gets no account.

At the lowest calculation, if 10 brakemen are killed every day, that would be equivalent to 3,650 during the year, which, added to the number injured in various ways while on duty, would give the sum total of deaths and injuries about 14,600 a year. These are frightful figures of a fatality, a loss of life, or injury to the body, that is attributable either to accidents, carelessness, or negligence.

We therefore venture to assert that it is a fact that the public has no idea of the number of accidents that occur on the various railroads throughout the country every day; and it is also true that there is no vocation so fraught with danger to life and limb as that of the brakemen on our railroads, particularly on freight trains, men on passenger trains having a great many lives intrusted to their care, and, consequently, have a greater responsibility resting upon them than that which rests with the freight men.

Indeed the life of a freight brakeman is a precarious one. Some insurance agents, in some parts of the country, do not take risks on employés on freight trains; but conductors and brakemen on passenger trains are insured by their paying an extra per cent. Railroad men say that only about 25 per cent of the brakemen of freight trains die a natural death; also, that the average life of the brakeman, after he goes on the road, is about ten years.—*Boston Commercial Bulletin.*

The New Chesapeake Bay Lighthouse.

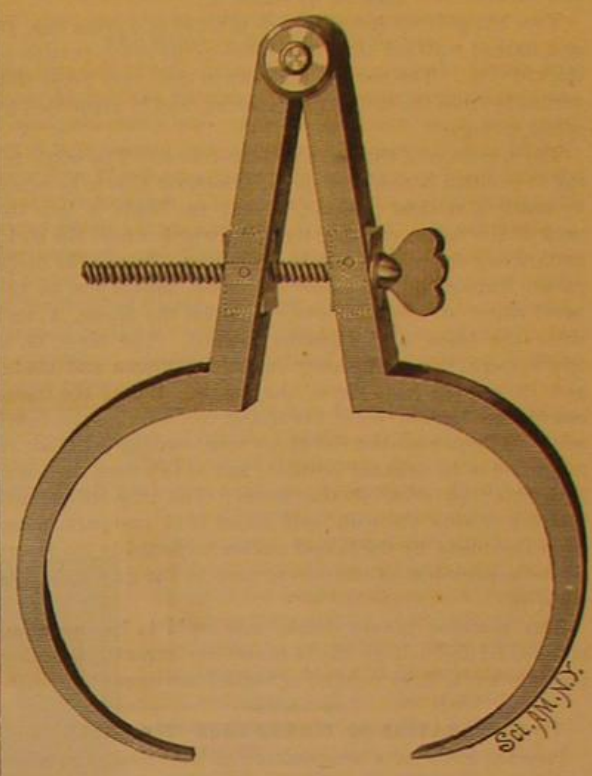
What is regarded as one of the finest lighthouses in the world is being erected in Chesapeake Bay, off Cape Henry. From base to top it measures 155 feet, with a diameter at the base of 30 feet and at the top of 16 feet. There are six stories, above which are a service room, watch room, lantern room, and finally the roof. Its total weight is 1,700,000 pounds, 7,000 pounds of bolts alone being required to put it together. The exterior, which is octagonal in shape, is constructed of cast iron, while the cylindrical interior is of sheet iron. The castings of the base and first story are two inches in thickness, and the sheet iron lining ⅜ of an inch. The staircase, which has iron sill steps, goes around the cylinder instead of up a shaft as in the lighthouses now in existence. The "light room" is a circular steel frame 12 feet in diameter and 9 feet high. The glass to be used is now being manufactured in France, and a light of great power will be adopted. Every story is solidly bolted together by heavy cast iron floor plates 1½ inches thick, while the points and facings are finely planed, four planers having been kept running day and night for the entire eighteen months. So closely are the plates fastened together that from the outside each story looks like a solid piece of iron. The base and windows are elaborately ornamented with castings, while a handsome iron railing surrounds the watch room. Many of the bolts are 1¾ inches in diameter at one end, and ⅜ of an inch at the other. The iron work was furnished by Messrs. Morris & Trasker, Philadelphia.

Tin in the Sierra Madre, California.

The *Commercial*, of Los Angeles, Cal., reports that an assay of tin ore from the mine discovered near Pomona, showed a result of $89.70 per ton in tin. This mass of tin ore has hitherto been mistaken by prospectors for common rock stained with iron.

IMPROVED DIVIDERS AND CALIPERS.

The engraving represents an improvement in dividers and calipers, recently patented by Mr. Edward Soetbeer, of New Bremen, O. The invention consists in the adjusting device, which is arranged so that the instrument may be opened or closed and held firmly in any desired position. A swiveled bearing in one leg of the instrument and a swiveled nut in the other leg receive the adjusting screw, which is



SOETBEER'S CALIPERS.

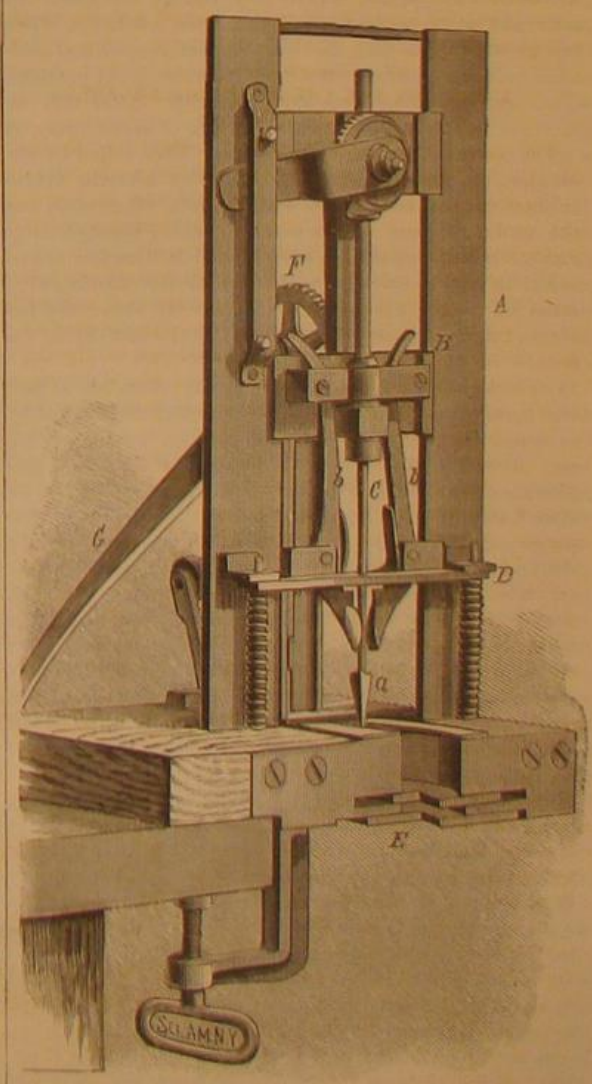
prevented from longitudinal movement by a circumferential groove in the shank of the screw, and a pin extending through the bearing and through the groove in the screw.

It will be seen that by this construction the bearing and nut of the screw are always parallel to each other, and the adjustment of the instrument is positive.

Further information may be obtained by addressing the inventor as above.

NOVEL CORK EXTRACTOR.

We give an engraving of a novel cork extractor lately patented by Mr. Chester C. Clark, of Brownwood, Texas, and designed for drawing corks from bottles containing champagne, beer, ale, mineral waters, etc. It is to be attached to



CLARK'S AUTOMATIC CORK EXTRACTOR.

a table, shelf, or counter, and is operated by the lever handle, G, projecting from the back of the apparatus.

The bottle from which the cork is to be extracted is placed between the jaws, E, which close and hold it securely when

the lever, G, is raised to drive the harpoon head, *a*, downward through the cork. The lever, G, has its bearings in a cross piece of the frame, A, and carries a segmental gear wheel, F, that engages a rack on the back of the slide, B. A shaft journaled in this slide carries at its lower end the extracting instrument, *a*, and is provided with a pinion near its upper end that is engaged by a bevel wheel journaled on the slide, B, and carrying an arm that extends laterally and between two stops on its frame, A.

Two bill-pointed levers, *b*, are pivoted in a cross bar, D, and extend upward through guides in the lower portion of the slide, B. The bar, D, slides upon two rods projecting vertically from the bed of the machine, and is supported by spiral springs.

The operation of the machine is as follows: The bottle being in position between the jaws, E, the lever, G, is to be raised to nearly a vertical position, forcing the blade, *a*, into the neck of the bottle, severing the wires which secure the cork, and cutting the cork in two in the center. Just as the blade passes through the cork the end of the lateral arm on the bevel wheel strikes the lower stop on the frame, A, and turns the blade, *a*, one quarter around. The lever, G, is now brought down, elevating the sliding frame and blade, and lifting the cork from the bottle. Before the frame reaches its highest point the end of the lever on the bevel wheel, G, comes against the upper stop, causing the blade to be turned to its original position, and at this time the jaws, E, release the neck of the bottle. The two bill-pointed levers, *b*, divide the cork and expel it in two parts away from the blade by the lateral motion imparted to the levers by the engagement of the curved ends by the guides on the slide, B.

This machine is very simple and rapid in its operation, and should find a large use in hotels, restaurants, and other places where a large number of bottles are opened.

PREPARATION OF TINNED IRON—TIN PLATE.

Pure tin melts at a temperature of 424° Fah., and when iron, thoroughly cleansed from oxide and other impurities, and heated somewhat above this temperature, is plunged into the melted metal and allowed to remain there for a time it receives and retains a coating of the white metal. The chief difficulty in this plating process is to get the surface of the metal properly cleansed. The process of tinning sheet iron as usually conducted will show how this is accomplished. It is briefly as follows: Charcoal iron of the proper thickness is cut into rectangular pieces of the required size—usually from 12¾x9½ to 16¾x12½—and bent U-shaped so as to stand on edge. The plates are then placed in an acid pickle, usually of diluted sulphuric acid, though sometimes hydrochloric acid is preferred. In Pittsburg a hot 10 per cent solution of sulphuric acid is employed, and the pickling operation continued for about twenty minutes. From the pickle the plates are transferred to a closed annealing muffle or oven heated to redness, where they remain for about six hours and scale or free themselves from oxidation, when they are allowed to cool, and are then straightened and cold-rolled between polished steel rollers under great pressure, which imparts smoothness and elasticity. After this the plates are usually again annealed for six or seven hours, at a much lower temperature than before. Then follows a second pickling—in warm dilute sulphuric or muriatic acid—for about ten minutes, and in some cases a slight scouring with sand and hemp. After quickly running through water from the last operation they are plunged into melted tallow (free from salt) or palm oil, and when the moisture has been driven off by the hot grease or oil and the plate itself has become thoroughly heated it is ready for the first dip in the tin.

The series of pots in which the tinning operation is performed are placed together on a low brick furnace called by the workmen the "stow." These pots are usually of cast iron. The first, the *tin pot*, is rectangular in shape, and holds about five hundred pounds of block and grain tin, on which floats about four inches depth of pure tallow to prevent oxidization of the metal. The furnace envelops the sides and bottom of this vessel. Alongside this is the grease pot. The *wash pot*, similar to but smaller than the *tin pot*, which it adjoins, is nearly filled with best grain tin, and is provided with a partition to prevent dross gathering at the point at which the last dip is given to the plates. The next vessel is called the *pan*, and is used for draining the plates; it has a grating at the bottom and no fire under it. The last vessel, the *test pot*, has only about one-quarter inch depth of tin in it.

The operation of tinning the plates is as follows: Each plate is lifted singly from the *grease pot* and stood on edge in the tin pot and allowed to remain immersed in the hot tin for about twenty minutes. (The *tin pot* is always kept nearly full of plates.) When lifted out the plate is allowed to drain for a moment, and is then changed to the first division of the *wash pot* for a few minutes, on leaving which it is brushed with hemp, dipped in the second division of the pot, and allowed to drain for a few minutes in the pan. The thick edge or list is removed by momentarily dipping it (the edge) in the hot tin contained in the *list pot* and jarring the plate. After this the plate is returned to the *grease pot* for a few minutes, from which it is drawn out between rollers which smooth and straighten the plates. They are finally cleaned by rubbing them with shorts or bran and leather, sorted, and boxed—each box of I.C. plate containing 112 pounds or 112 plates, the plates having a gauge of No. 30, and weighing one pound each. I.X. brand weighs 140 pounds to 112 sheets.

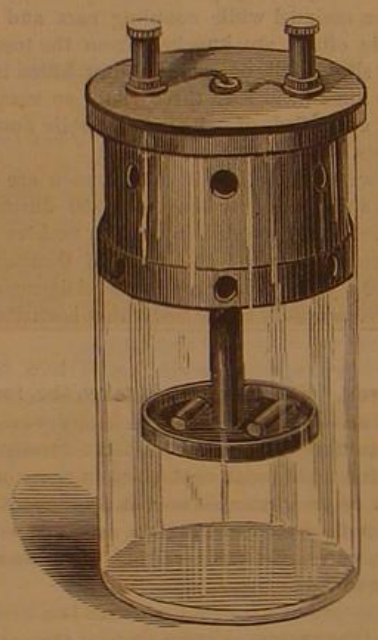
In the trade the grade, weights, and sizes of the plates are indicated by certain marks, as shown in the following table:

Names.	Sizes—Inches.	Number in a box.	Weight in a box—Pounds.	Box Marks.
Common No. 1	13¾x10	225	112	CI.
" No. 2	13¾x 9½	225	105	CII.
" No. 3	12¾x 9½	225	100	CIII.
Cross No. 1	13¾x10	225	140	XI.
Two Cross No. 1	13¾x10	225	161	XXI.
Three Cross No. 1	13¾x10	225	182	XXXI.
Four Cross No. 1	13¾x10	225	203	XXXXI.
Common Doubles	16¾x12⅛	100	77	C.D.
Cross Doubles	16¾x12⅛	100	126	XD.
Two Cross Doubles	16¾x12⅛	100	174	XXD
Three Cross Doubles	16¾x12⅛	100	168	XXXD.
Four Cross Doubles	16¾x12⅛	100	189	XXXXD.
Common Small Doubles	15 x11	200	168	C.S.D.
Cross Small Doubles	15 x11	200	189	XSD.
Two Cross Doubles	15 x11	200	210	XXSD.
Three Cross Doubles	15 x11	200	231	XXXSD.
Four Cross Doubles	15 x11	200	252	XXXXSD.
Wasters Common No. 1	13¾x10	225	112	W C.I.
Wasters Cross No. 1	13¾x10	225	140	W XI.

MAICHE'S BATTERY.

The inventor of this entirely original form of battery, of which we give an illustration, has endeavored to fulfill all the conditions necessary to make his battery work for an indefinite period, and this ideal result is obtained—thanks to the means of depolarization which he employs.

A porous vase, pierced with large holes, is fixed to an ebonite cover, which closes an earthenware vase filled with retort carbon, broken in pieces and platinized. The porous vase is traversed by an ebonite tube supporting a small porcelain cup, in which is placed a small quantity of mercury and two small pieces of zinc. A platinum wire, connected to a terminal fixed on the cover, dips into the mercury, and establishes a good contact with the zinc.



MAICHE'S BATTERY

Another platinum wire connects a second terminal with the carbon fragments placed in the porous vase. The contacts are thus completely assured. The zinc is not attacked, except when the circuit of the battery is closed; it is plunged entirely in the liquid, consequently it is entirely used up without any loss.

Under the influence of the platinized carbon the hydrogen of the water, which tends to polarize the carbon, combines with the oxygen of the air. That this novel effect, sought for in vain for a long time, can take place, the carbon should only be partially immersed in the water; the rest becomes wetted by capillary action, and presents a considerable surface to the air.

The water produced by the combination of the hydrogen and the oxygen contributes, to a certain degree, to replace that which passes off by evaporation, and which the cover keeps from being lost.

The electromotive force of this battery is about 1·250 volts; but it is necessary to work it through an external resistance of about 3 kilometers of ordinary telegraph wire in order that it may work well. The exciting liquid may be water saturated with sal-ammoniac, or acidulated by sulphuric acid, or the bisulphate of soda, in the proportion of 10 to 1.

An element working a bell about 100 times a day would not require to be looked after for a very long time, and, in this case, it would only be the zinc that would require replacing, as the platinized carbon preserves indefinitely its catalytic properties.

The Maiche battery is particularly well adapted for electric bells. Maintenance not being required, its fitness and the care taken in its whole construction make it the most perfect bit of apparatus of its kind.—*L'Electricité.*

American Philological Society.

The thirteenth annual meeting of the American Philological Society began in Cleveland, Ohio, July 12, with about thirty members in attendance. The papers and discussions of the first day embraced "Homer and Strabo," by Prof. Egrihler, of Johns Hopkins University; "Latin Words in the Talmud," by Prof. James S. Blackwell, of the University of Missouri; and "The Home of the Original Semitic People," by Prof. Loy, of Howard University. In the evening the annual address was delivered by Prof. Lewis R. Packard, President of Yale College.

On the second day papers were read as follows:

"History of the 'A' vowel, from old Germanic to Modern English," by Dr. W. Weelsey, of the Johns Hopkins University, Baltimore; "Verses of Text respecting the Precious Stones of Scripture," by Prof. Blackwell, of the University of Missouri; "Mixture in Language," by Prof. W. D. Whitney, of Yale College; "Language of the Isle of Man," by Mr. W. S. Kerruish, of Cleveland; "The Use of Abstract Verbal Nouns in Thucydides," by Dr. E. G. Sihler, of New York; "The Vowel Scheme of Melville Bell," by Prof. Samuel Porter, of the National Deaf Mute College, Washington.

The Patent Laws.

We are asked by a Pawnee City, Neb., correspondent if we are not mistaken, when we say that the owner of a patent can collect a royalty of an innocent purchaser. Certainly not; that is one great defect in our patent laws, and one which calls most loudly for a remedy. A farmer goes to the village or city, and among the score or hundreds of stores he sees hundreds or thousands of manufactured articles, and it is utterly impossible for him to know whether they are patented or not, unless they are marked, and it is perfectly unreasonable to expect him to know. Amidst this ocean of implements and tools he sees something that he needs, and innocently purchases it, paying for it all that it is worth, and probably all the patentee would ask for it, if it were purchased of him; but the article being unmarked, he is not informed that it is patented, and if it were marked, the patent mark might be forged. He takes home his purchase, and after awhile the patentee discovers the article in his possession, and compels him to pay a royalty. The principle has been carried out in connection with the drive well swindle. Nobody supposed that there was any patent upon drive wells, but one turned up at last, and the man who had a drive well upon his premises was called upon for a royalty.

There is no shadow of justice in such a law. Nobody has a right to ask of the law immunity from all liability of loss, and in the vast majority of cases the seller of a patented article is sufficiently responsible to save the patentee harmless. As the law now stands, it is dangerous for a farmer to purchase anything unless he knows all about the patent, when it was granted, to whom it was granted, who owns it at the present time, and by what authority the seller presumes to sell it. All this is unreasonable, and every unprejudiced person in all the world must unite in that conclusion. The courts are open for a patentee to obtain an injunction against parties wrongfully selling his patent, and furnish him all the means of protection which the owners of other property have. Let him, therefore, resort to those means, and keep his hands off the farmer, whom the patent man seems to especially select for the purposes of oppression. —*The Western Rural.*

The Laws of Property.

We are asked by an Erehwon correspondent if we are not mistaken when we say that the owner of a horse or a farm can retake his property from an innocent purchaser (the seller having no legal right to sell), or compel the buyer to pay a second time.

Certainly we are not mistaken. That is one great defect of our property laws which thieves and swindlers complain of most loudly.

A city mechanic wants to live in the country, and out of the scores and hundreds of houses and farms and animals there, the history of which he cannot be expected to know, he selects something which he wants, and pays a fair price for it to the man who offers it for sale. When he takes possession the real owner turns up and dispossesses him, or makes him pay a second time. In this way hundreds of innocent mechanics have been swindled in the purchase of farms and horses and cattle and such things.

There is no shadow of justice in such a law. Nobody has a right to ask of the law immunity from all liability to loss, and in the vast majority of cases, the farmer whose property has been sold without his consent should find the seller sufficiently responsible to save himself from loss. It is cruel in him to dispossess the innocent mechanic, who has already paid a fair price for what he has bought.

As the law now stands, it is dangerous for a mechanic to purchase a horse or a house unless he knows all about the owner of it, by what authority the seller offers it for sale, and has a lawyer make a search of the title deeds and all that.

All this is unreasonable, as every unprejudiced land-sharp and horse thief will agree. The courts are open for a farmer to obtain an injunction against parties wrongfully selling his horse or his house or his farm; and he has in that all the protection he can reasonably ask for. Let him therefore resort to those means and keep his hands off the innocent mechanic, whom land-sharps and horse thieves would be glad to prey upon if they found him foolish enough to "go it blind" in his purchases.—*Scientific American.*

Improved Transportation of Fresh Fruit.

A recent shipment of fresh fruit from California to Philadelphia introduces a very promising improvement in the transportation of such perishable commodities. The car contained grapes, plums, peaches, and apricots packed in carbonized wheat bran; an inexpensive packing, which is claimed to preserve fresh fruit for long periods, making possible their transportation across the continent as "slow freight," at a saving of $600 a car load in freight charges.

Correspondence.

Flat Cast Iron Boiler Heads.

To the Editor of the Scientific American:

In your issue, dated July 2, is an article headed "Boiler Explosion Notes," referring to the explosion at Messrs. Gaffney & Co.'s works, Philadelphia, in which you indicate that "the jury rendered an erroneous verdict, and did not avail themselves of the means at their hands to verify practically the correctness of their conclusions."

The treachery of flat cast iron boiler heads has been practically proven and verified by the numerous explosions they have caused, and the trouble has been that in many cases the true cause of the explosion has not been traced to the flat boiler head, but other reasons given, such as low water, overpressure, etc. After having noticed many such cases in the year 1865, I published in Philadelphia papers and also in my Pocket Book the principal causes of steam boiler explosions, of which one was as follows:

"5th. It is a very bad practice to make boiler heads of cast iron, composed of a flat disk of from two to three inches thick, with a flange of from one to two inches thick, with cast rivet holes. The first shrinkage in the cooling of such a plate causes a great strain, which is increased by riveting the boiler to it. Any sudden change of temperature, therefore, either in starting or putting out the fire, might crack the plate and thus occasion an explosion. Such accident may be avoided by making the cast iron head concave and of even thickness."

The same has been published in my "Treatise on Steam Engineering." These books are well known by the Hartford Boiler Insurance Company, which, moreover, ought to have more experience than I have in the treachery of flat cast iron heads. You say; "The jury had the opportunity of submitting the remaining boilers to a thorough test, and of determining on the spot, in the most convincing manner, whether the inspectors whom they complain of had really been remiss in their duty, and whether the jury's notion that flat cast iron heads are unsafe was really correct."

Such an experiment would have been of no practical use, for the jury would probably have found that the shell of the boiler bursted without injuring the head. The exploded boiler was submitted to hydrostatic pressure by the boiler inspector, who found it strong enough for that purpose, and if he had put on sufficient pressure the shell would probably have bursted first. It is not the pressure alone in the boiler which causes the head to burst, but principally the strain in the iron caused by change of temperature.

It is true, as you say, that "flat cast iron boiler heads are used on hundreds of boilers in all parts of the country, and many years' trial has proved them to be safe and serviceable." A flat cast iron head may be much stronger than a concave wrought iron head, but the mischief is that we have no means of knowing when it is good or bad, for its internal condition cannot be seen from the outside; it may be full of air holes and overstrained by shrinkage, so as to make it burst before it is put into the boiler, of which there have been examples.

The most eminent engineer in Philadelphia defends and approves cast iron heads, and he has a theory to anneal them, as is done with carwheels, which would no doubt remove most of the shrinkage strain, but it would not remove the airholes, nor would it equalize the uneven temperature which the boiler head is subjected to. The strain on a car wheel is of an entirely different nature from that of a boiler head, and if his theory is adopted, there will be more "practical experience" in steam boiler explosions.

In one case, a boiler with flat cast iron heads exploded after the fire had been drawn out and the steam pressure reduced far below its normal working pressure, which explosion killed, if I remember right, six men.

With the above considerations, Mr. Editor, I am convinced that the verdict of the jury was a just one, and the wholesome effect it produced is realized by the fact that the Hartford Boiler Insurance Company has now ordered their boiler inspectors in Philadelphia not to insure boilers with flat cast iron heads over 30 inches in diameter. After the company gets more "practical experience" in boiler explosions with flat cast iron heads I hope they will reduce that diameter to 15 inches. In old times, flat cast iron boiler heads were made of charcoal iron, which is much stronger and less liable to strain by shrinkage than is anthracite iron. Charcoal iron also flows more solid in castings and has less air holes than anthracite iron. You say in the article above referred to that "from all the information we can gather it seems pretty certain that the explosion was due to an overpressure of steam," etc.

I assure you, Mr. Editor, that the informations published in the papers about this explosion are in the main unreliable. The safety valves were in good order and did not blow off steam before the explosion, and it was testified in the coroner's inquest that the steam was far below its normal pressure shortly before the explosion. The boiler head evidently burst by shrinkage or expansion strain in the casting.

JOHN W. NYSTROM.

1010 Spruce street, Philadelphia.

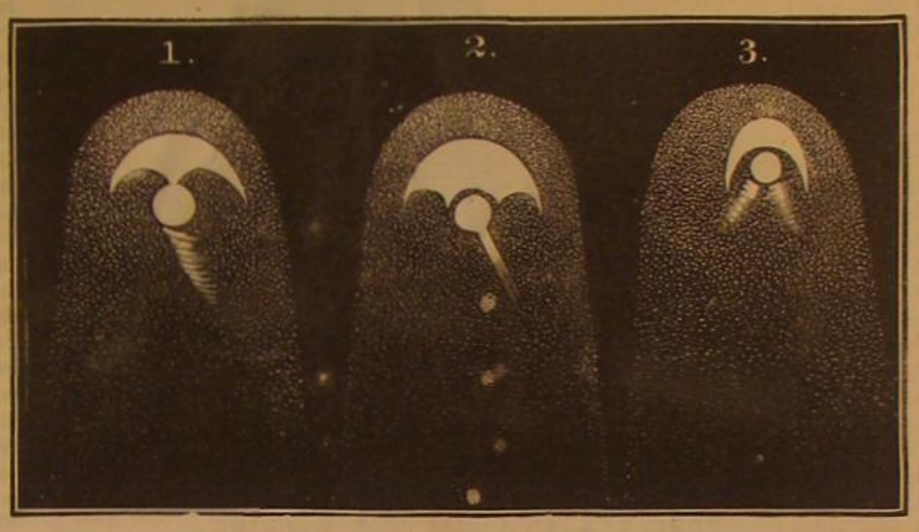
Telescopic Views of the Great Comet of 1881.

To the Editor of the Scientific American:

The accompanying sketches are telescopic views of the comet now adorning our northern heavens. Only the head of the comet is here represented, showing the appearance of the nucleus and coma, and the changes which were observed on the dates mentioned.

Fig. 1. shows the head of the comet as seen on the evening of the 24th ult. The nucleus was round, bright, and of an intense ruddy hue, to the naked eye appearing as bright as Mars. In front of this was a rather slender crescent, less bright, apparently connected to the nucleus, as shown in the sketch.

Fig. 2 shows its appearance on June 26. The nucleus was less bright than on the last observation, with a peculiar flame-like appendage issuing therefrom in a direction opposite from the sun. The crescent had taken the form shown in the engraving.



On July 1 the comet had taken the form shown in Fig. 3. The crescent form was much contracted, was not concentric with the coma as on former occasions, and two faint rays were seen to issue from the nucleus. These changes show great activity, and will doubtless continue, although not in so marked a manner, for same time to come.

WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y., July 11, 1881.

Early Observations of Comet 2, 1881.

To the Editor of the Scientific American:

Who first, in this country, saw the great comet now gracing our northern heavens is a question of interest. From recent observations, in verification of a belief expressed at the time of the comet's announcement, it seems conclusive that very early *telescopic* observations were obtained of the northern end of the comet's tail at my observatory, namely, on the mornings of June 18 and 19 at 2 o'clock.

On the above dates I was sweeping for new comets—as has been my custom upon every favorable night for several years—when at about 2 o'clock I pointed my telescope close down to the horizon for a sweep through the northeastern sky, when, at a point between Capella and Beta Aurigæ, I encountered a misty beam of light. I at first supposed it to be a branch of the Milky Way, but although there were many telescopic stars in the field there was a continuity about the light which attracted my attention. It was brighter on the 19th than the morning previous, which I attributed at the time to a clearer atmosphere, not then suspecting its true character. I am now strongly convinced that it was the northern or upper end of the comet's tail, seen some days before the head had risen far enough to become visible in this country. Its position was about R. A. 5 hours 25 minutes, north declination 35°. The comet's position at announcement, on June 23, would agree very well with this place at the dates mentioned, namely, the 18th and 19th inst.

My verification of this opinion has been delayed by an unfavorable sky—a low bank of misty clouds completely hiding for many days the region of Auriga. But on the morning of July 4, also on the morning of the 7th, the opportunity for which I had been watching came. A clear sky in the vicinity of Capella permitted a careful search, when the beam of light previously seen had *entirely disappeared*.

I have waited for a third observation, but the moon at present interferes. Fortunately the *absence* of this beam of light from the place named can be verified by an examination at any future time; and its absence must, I think, convince every candid mind that a telescopic view was obtained by me of the comet's tail as early as the mornings of June 18 and 19.

Dense misty clouds, which soon gathered in the northeastern morning sky, prevented me from detecting its true nature at that time, and seeing more or less of the entire comet rise.

WILLIAM R. BROOKS.

Red House Observatory,
Phelps, N. Y., July 13, 1881.

The Florida Drainage Scheme.

Mention has already been made of the gigantic scheme for the drainage of the Florida Everglades undertaken by certain Philadelphia capitalists. According to a report by the engineer of the company, the country to be opened to cultivation covers over 17,000 square miles, lying about and to the south of Lake Okeechobee. The land reclaimed will embrace every class of Florida land, including "high and low hammock," "first, second, and third rate pine," and "swamp lands," and under the terms of the contract between the company and the State of Florida one-half of the 8,000,000 acres to be reclaimed by the lowering of the lake waters will revert to the company. Valuable deposits of hematite ore and marl are also reported.

Lake Okeechobee is described as the grand inland reservoir for the waters of middle Florida, having no natural or direct outlet. The principal feeder to it is the Kissimmee River, which pours in a constant supply of 207,360,000 cubic feet of water every twenty-four hours. The amount of evaporation from water surfaces exposed to sun and wind is set down in the books at the rate of from one-eighth to three-eighths of an inch per day, according to conditions. Lake Okeechobee having an area of 1,000 square miles, the evaporation from the surface of the lake aggregates at the lowest rate 290,400,000 cubic feet of water, which is more than one-third in excess of the supply from the main feeder. During the ordinary seasons, and particularly during periods of drought, the level of the water in the lake is lowered, the surrounding land becomes in a measure passable, and large herds of cattle obtain excellent pasturage in the savannas and swamp lands of the interior. Then when the rainy season comes, four months in the year, the waters of the lake gradually rise, overflow the immense tracts of sugar land, the soil of which is identical to that of Cuba, and back up the waters of the rivers emptying into the lake.

It is the purpose of the company just formed to permanently lower the surface of Lake Okeechobee, which, according to the United States survey of 1879, is twenty-five feet above mean low tide, by constructing a drainage canal twenty-one miles in length to the St. Lucie River at a waterfall of one foot a mile. This plan is similar to that recommended by Colonel Meigs to the National Government in 1879. In the proposed canal this waterfall will give a velocity of two and two-thirds miles per hour and a capacity of passing 733,708,800 cubic feet in twenty-four hours.

Three steam dredging machines of the Menge patent, constructed on the continuous ladder principle and resembling the buckets in a grain elevator, are now being put together at Jacksonville, the hulls being already in shape. Each dredge will be capable of making a clean cut of twenty-two feet in width. The dredges will be lashed in pairs, so that at one operation they will open a canal forty-four feet wide. To dig the canal from Lake Okeechobee to the St. Lucie River will require the excavation of 9,000,000 cubic yards, which, at a rate of two cents a yard (the Menge figure), will amount to $180,734, and at an outside figure of five cents a yard will amount to $451,336.

In addition to this canal it is the design to build another canal from Lake Okeechobee to the Caloosahatchie River, emptying into the Gulf; also to deepen and straighten the streams emptying into Lake Okeechobee, to dig lateral canals or ditches, and at various points to tap the ridge separating the saw-grass marshes from the Atlantic and the Gulf, thus draining the remotest sections of that great region.

MISCELLANEOUS INVENTIONS.

Mr. Edwin Thacher, of Pittsburg, Pa., has patented an improved bridge-truss. The object of this invention is to overcome the defects common to a greater or less extent in all forms of triangular or quadrangular truss now in use.

Mr. George Brucker, of New York City, has patented a nickel-plating fluid composed of a saturated solution of pure nickel in nitric acid, and of hyposulphite of soda and cream of tartar.

An improved slide for guard chains which can be adjusted very readily and can be used with chains of any desired thickness, has been patented by Mr. Lewis H. Sondheim, of New York city. It consists in a casing provided with a hinged or removable side and with a longitudinal partition dividing the casing into two compartments provided with springs for pressing the chain passing through the compartments against the opposite side of the casing, by which this casing is held on the chain in the desired position.

IMPROVED SLOTTING MACHINE.

We give an engraving of a machine for slotting wheels, pinions, etc., for the reception of the keys which secure them in position on their shafts. The solid iron frame supports a circular iron table truly turned, and having several holes for the reception of the vertical threaded studs which confine the yoke that bends the wheel or pinion to the table. A steel saw or cutter projects through a hole in the table and through the bore of the wheel, and is connected at its lower end with a slide moving in ways below the table, and connected by a strong connecting rod with a crank which is driven by a train of gearing from the driving shaft, the latter taking its motion from any suitable source of power through a belt. The gearing increases the leverage of the power over the saw or cutter, so that the motion is very strong and positive, and the work is quickly done. One pair of the gears is made elliptic, which secures a slow movement of the cutter downward while cutting the metal, and a quick return movement upward. The saw is fed up to its work by the lever run at the back of the yoke, and the cut may be made light or heavy according to the character of the work.

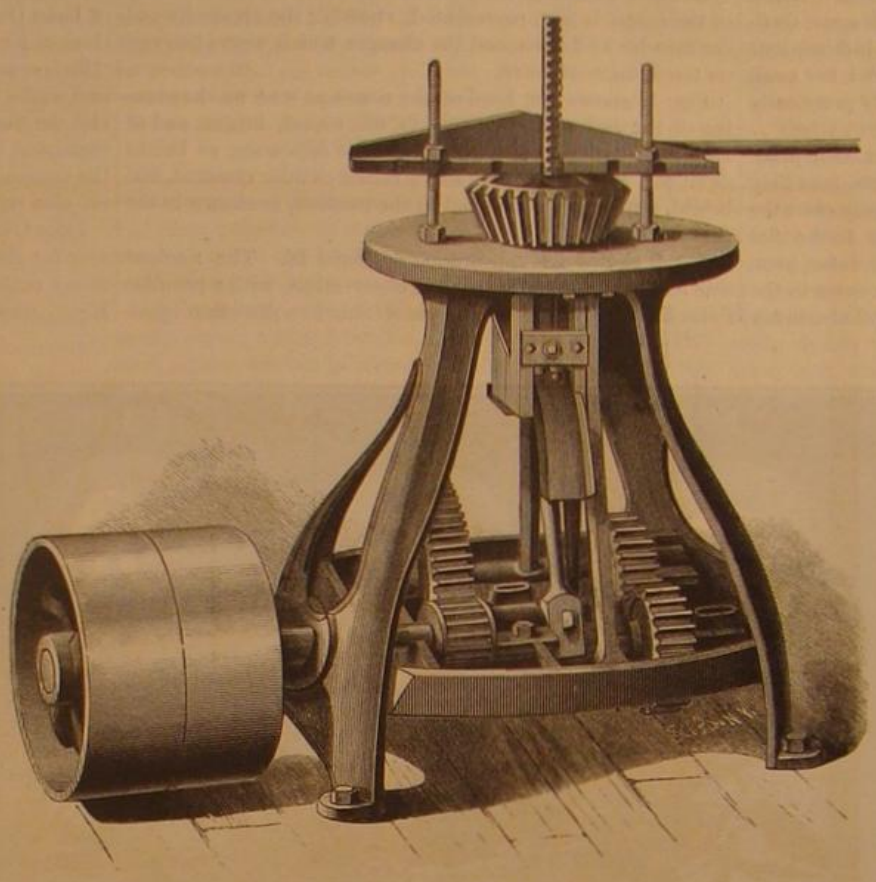
The saw is capable of being ground on an emery wheel, so that it is always possible to have a sharp tool. Different sized saws are made for keys of different widths.

The gearing and slides below are protected by suitable shields which deflect the cuttings so that they fall to the floor. The work is very readily placed in the machine and removed therefrom. The capacity of the machine is much greater than ordinary slotting machines employing a single cutting tool.

The difficulty heretofore with machines of this kind has been that they would leave the key-way higher in the middle than at either end, which necessitated the use of files to true it up.

The machine illustrated avoids this and leaves the key-ways true and ready for the keys without further work. Key-ways of equal depth at each end for feathers, etc., are also readily cut. The rounding up of the bottom of the key-way is avoided by rigidly connecting the cutter to a bar which extends down to the bottom of the machine and there passes through a guide. This guide is pivoted so that the sliding bar may adjust itself to the angle of slope desired for the bottom of the key-way. By this arrangement a movement of the cutter is secured which is parallel to its previous cut, and the defects in the key-ways above mentioned avoided. This machine was patented November 11, 1879.

Further information may be obtained by addressing Messrs. Trevor & Co., manufacturers, Lockport, N. Y.



TREVOR & CO.'S SLOTTING MACHINE.

IMPROVED LUBRICATOR.

Two important results are secured by using upon an engine a lubricator that furnishes a continuous and equable supply of oil to its cylinders. In the first place the engine is properly and sufficiently lubricated, and its durability and efficiency is increased; and in the second place a great saving of oil is effected. The engraving shows a complete and simple device for furnishing a continuous supply of lubricant to engine cylinders, and especially designed for locomotives.

Figs. 1 and 2 are vertical sections of the apparatus taken at right angles to each other, and Fig. 3 is a vertical section of the drop tube.

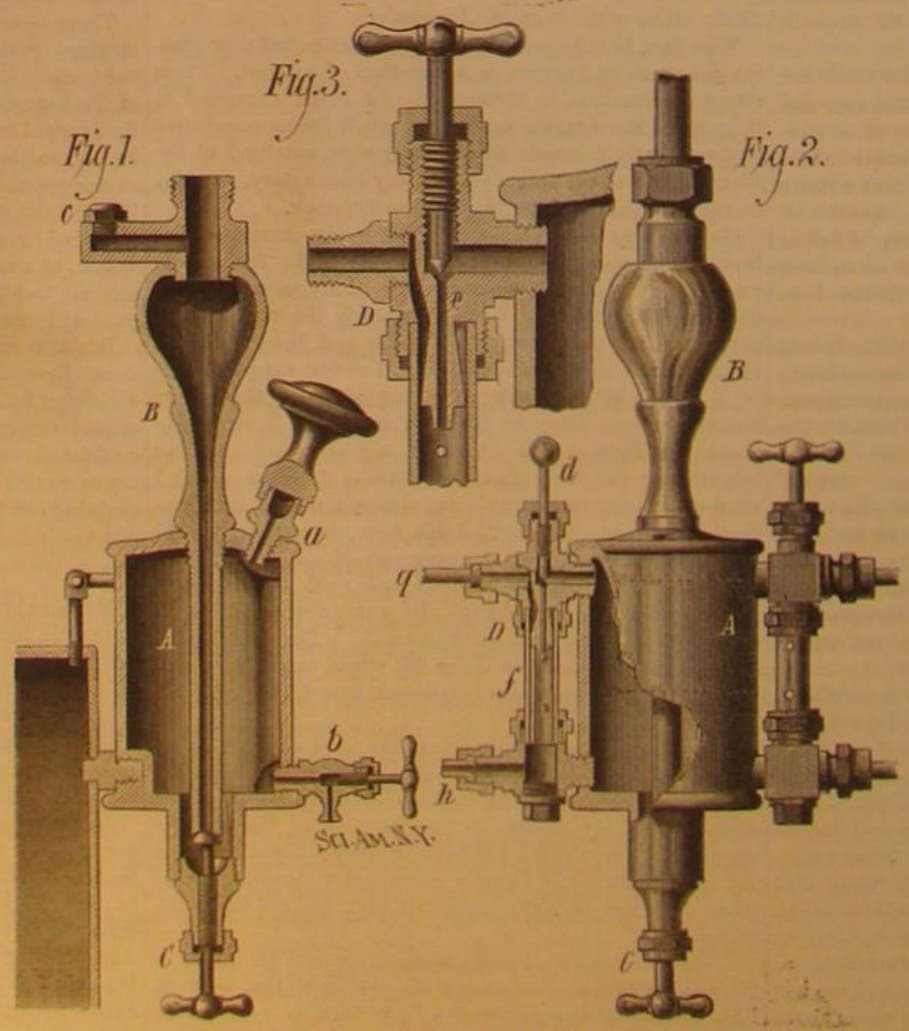
The main chamber, A, of the lubricator is attached to the front plate of the locomotive boiler, and is provided with a pipe, B, that extends downward in the chamber and receives steam from the boiler. The lower end of the pipe, B, is received in a cavity formed at the bottom of the chamber, and is fitted to a valve, C, by which it may be closed more or less to regulate the supply of steam.

In opposite sides of the chamber, A, there are drop tubes, D, communicating with the interior of the chamber near the top, and discharging into a glass tube, *f*, connected with the pipe, *h*, leading to the steam chest of the cylinder. The drop tube is under the control of the valve, *d*, and communicates by a steam pipe, *g*, with the steam room of the boiler. The lower end of the drop tube is reduced in size to insure the falling of the drop in the middle of the glass tube, where it may be observed, and the water of condensation from the steam, entering through the pipe, *g*, is deflected by the conical sides of the drop tube, so that it follows the inner side of the glass tube, and does not interfere with the dropping of the oil. The pipe, *h*, leading to the steam chest has, near the engine cylinder, a double seated ball check valve, which prevents air or steam from being forced back into the oil chamber, A. The apparatus, so far as the drop tubes, side steam, and oil pipes are concerned, is made double to adapt it to the two cylinders of a locomotive, and the oil chamber is divided vertically by a median partition to insure an equal action of the two parts of the device. At the top of the oil chamber there is a plug, *a*, which may be removed whenever it becomes necessary to fill the chamber, and at the bottom there is a small valve, *b*, for letting out the water.

When this lubricator is in use there is an equality of pressure everywhere, and the water resulting from the condensation of the steam from the pipe, B, displaces the oil, which flows over into the drop tubes, D, and falls, drop by drop, through the clear space in the glass tubes, *f*, into the pipe, *h*, which conveys it to the engine cylinder. The flow of oil through the drop tube is controlled by the valve, *d*.

With this device perfect lubrication can be insured without the constant attention of the engineer and fireman. The lubricator is readily applied to the boiler front of the locomotive, in the engine room of vessels and steamboats. For stationary engines, the above lubricator can be placed on the wall of the engine room, and supply with oil the one or more engines and steam pumps. A single lubricator is also made to apply on the steam pipe of stationary engines with one connection. One hundred of these lubricators are now in use, and the manufacturers refer to some of the largest manufacturing works in this country. Some of the railroad companies who have adopted it say they obtain perfect lubrication up and down grade, and effect a saving of 75 per cent in oil, and obtain more power from the engines owing to this system of lubricating, and effect a great saving on the valves and packing.

This invention was recently patented by Mr. Timothy Holland, and is manufactured by Messrs. Holland & Thompson, 217 River street, Troy, N. Y.



HOLLAND'S ENGINE LUBRICATOR.

Glycerin.

Notwithstanding the low price which now prevails for raw produce and manufactured goods, there are a few articles which form notable exceptions. Perhaps one of the most remarkable of these is refined glycerin, which, within the last two years, has advanced from about £30 to £130 per ton avoirdupois for 30° B. This enormous advance is due partly to increased consumption, diminished production, and the influence of speculation working on a market devoid of stocks. In view of the present position of the article and the prospect of a continuance of high prices for a considerable time to come, the attention of soapmakers is now being turned to the utilization of their waste "lyes," and various new processes for recovering the glycerin contained in these liquors have lately been tried with more or less successful results. Apart from minor impurities, waste soap "lyes" are generally found to contain glycerin, carbonate of soda or caustic soda, chloride of sodium, gelatin, and albumen. One of the processes for recovering the glycerin which promises to be the most economical and the most successful, begins with concentrating the liquor until the salts contained therein begin to crystallize. The liquid is then cooled and filtered to rid it of gelatin and albumen. It is afterwards made to absorb carbonic acid, which precipitates bicarbonate of soda, and which is separated from the liquor in the usual way. After undergoing this process the liquor is then made to absorb gaseous hydrochloric acid until what remains of carbonate of soda has been converted into chloride, and further, until all, or almost all, the chloride of sodium has been precipitated and separated from the liquor in the usual manner. Arrived at this stage, the liquor contains water, glycerin, and hydrochloric acid. The acid is then evaporated entirely and absorbed in water for using afresh. The dilute glycerin remaining can be purified by filtering it through animal charcoal or by concentrating and distilling it in the usual way.—*Glasgow Herald.*

Iridescent Copper.

A new invention for coating iron and steel with iridescent copper, says the *Revue Polytech.*, is the work of Dr. Weil, of Paris. First, thirty-five parts of crystallized sulphate, or an equivalent amount of any other salt of copper, are precipitated as hydrated oxide by means of caustic soda or some other suitable alkaline base; this oxide of copper is to be added to a solution of 150 parts of Rochelle salts, and dissolved in 1,000 parts of water; to this 60 parts of best caustic soda, containing about 70 per cent NaO, is to be added, when a clear solution of copper will be formed.

The object to be coppered is to be cleaned with a scratch brush in an alkalino-organic bath, attached as a cathode, immersed in the coppering bath, and treated with the usual precautions, when it will become coated with an adherent film of metallic copper.

As the bath gradually loses its copper, oxide of copper, as above prepared, should be added, to maintain it in a condition of activity, but the quantity of copper introduced should not ordinarily exceed that above prescribed as compared with the quantity of tartaric acid the bath may contain. If the quantity of copper notably exceeds this proportion, certain metallic irisations are produced on the surface of the object. These effects may be employed for ornamental and artistic purposes.

According to the time of the immersion, the strength of the current, and the proportion of copper to the tartaric acid, the iridescences may be produced of different shades and tints, which may be varied or intermingled by shielding certain parts of the object by an impermeable coating of paraffine or varnish, while the iridescent effect is being produced on the parts left exposed.

All colors, from that of brass to bronze, scarlet, blue, and green, may thus be produced at will.

HOME OF THE AMERICAN OSPREY.

BY DANIEL C. BEARD.

Within half a day's journey of New York city lies an almost desert island, whose barren wildness is interrupted—marred, I had almost said—only by a single habitation. A stone lighthouse perched upon the bluff at the end of the island seems a natural accessory to this lonesome symphony of rock, sand, water, and sky. The inhospitable coast of this island offers no safe port or harbor, but the treacherous sandy beach is ragged and broken with huge bowlders and rocks, against whose flinty sides the angry impetus of the storm wave is dashed and splintered into foam and spray. The occasional fragments of wrecks strewn upon the beach, or forming appropriate monuments to the graves of drowned mariners, testify to the danger of the coast, and add a solemn tone to the sea-song of this desert isle. A marsh or swamp occupies the center of the island, about which grow trees of some height, being in a measure protected from the winds by the surrounding hills or mounds, whose sandy baldness is scarcely covered by a thin growth of wiry grass. At the foot of the hills, stretching to the water's edge, are sandy flats, dotted here and there with trees, gnarled, knotted, misshapen, and dwarfed by exposure to tempest and lack of nourishing soil.

Each summer's vacation, as our yacht has passed this island, my curiosity has been excited by the great number of birds which make it their home. It was partly to satisfy this curiosity, and partly to try the black fishing, which is excellent in the dangerous eddies of the tide, that induced the writer, with two companions, to land upon this island one quiet Sunday morning. As our little sail-boat approached the lighthouse we saw a couple of great northern divers swimming unconcernedly about, or ever and anon disappearing beneath the smooth waters. After landing, we walked over the sandy flats, disturbing by our footsteps scores of night-hawks (*Chordeiles popetue*). These mysterious birds filled the air overhead, and darted down past our ears with a loud whirring noise, while they all kept up a constant repetition of their peculiar cry. Numerous as these birds were we only succeeded in finding one egg. Nests they have none; but so closely does the egg resemble the lichens, dry grass, or moss, that although the mother bird may rise from beneath your feet, it will require a careful search and a sharp eye to detect the little roundish-shaped eggs.

In the low bushes or high grass along the edges of the swamp, we found numerous nests of the swamp blackbird (*Agelaius phœniceus*). Some meadow larks had their nests upon the grass plat in front of the lighthouse door, on top of the bluff. The sandy face of the bluff was perforated with innumerable burrows of the industrious bank swallow (*Cotyle riparia*).

On any part of the island, turn whichever way we would, the large nest of the fish-hawk formed a prominent feature of the landscape, and from sunrise to sunset the American osprey sailed around overhead in graceful curves, protesting with shrill cries against the invasion of their territory by strangers.

Baird says that the American osprey or fish-hawk nests almost invariably in the tops of tall trees. He gives as exceptions to this rule a nest upon a small pine tree in Maine, and one upon a cliff upon the Hudson River. Audubon, I believe, found two fish-hawks' nests upon the ground.

With these facts in my mind, I was somewhat surprised to find ospreys' nests scattered around promiscuously upon the sand dunes, piles of driftwood, tops of bowlders and small trees. The nests are all of them rather nicely built, the foundation consisting of quite large sticks, and in some instances pieces of plank weighing fully as much or more than the bird; over this foundation a layer, composed of seaweeds, sponges, and other odd material cast up by the waves, the nest itself being a shallow dish-like hollow, of fine soft seaweeds and grasses. Those I found upon the ground stood about two feet high, but some of them in the trees would measure, from foundation stick to summit, fully five feet. Such nests are eagerly seized upon by the purple grakle or crow blackbird (*Quiscalus purpureus*), and all the interstices between the sticks forming the hawks' nests are often filled with the nests of blackbirds. I counted six blackbirds' nests in the portion of an osprey's nest within sight; there were three eggs in the hawk's nest, and most of the blackbirds' nests contained young birds just out of the egg. Some ospreys' eggs that I took from a nest in a tree were prettily marked with dark purplish or wine-colored markings upon a cream-white ground. I noticed, however, that in four or five different nests upon the ground the eggs were all a dirty-brown color, harmonizing so perfectly with the dry seaweed lining of the nest as to require a quick eye to detect the egg in the nest when the observer stands only a few feet away.

After making some sketches, collecting some eggs, and catching about sixty pounds of blackfish, our party bade farewell to the island, and were rowed out to a passing steamer, which slowed up and took us aboard. A few hours after we were back in the hot dusty streets of the great metropolis, with only our sun-burnt faces to remind us of the island-home of the American osprey.

HOME OF THE AMERICAN OSPREY.

A Sitting Snake.

One of the Indian pythons (*Python molurus*) in the Zoological Society's reptile house, which has been until lately in company with a male of the same species, deposited a quantity of eggs last week, and immediately commenced the duty of incubation, which, as it would now appear, is as carefully performed in these highly-organized reptiles as in the case of the superior class of birds. The "pythoness" is an excellent mother, and has not deserted her post day or night up to the present time. The eggs, which are believed to be about twenty in number, are completely covered by her coils, and the mother herself by her blanket, so that she cannot be seen by the casual spectator. In 1862 a large West African python in the Zoological's Society's collection laid a quantity of eggs, and sat on them nearly ten weeks, after which, as there appeared to be no reasonable prospect of her hatching the eggs, they were removed. But upon subsequent examination several of the eggs were found to have the embryo partly developed. It is hoped, therefore, that a successful result may be obtained on the present occasion.—*London Times.*

Temperature of Least Resistance in Steel.

It is well known that a steel that is very flexible when cold breaks at the blue annealing temperature. It has generally been considered that the purer the iron is the less subject it becomes to this defect, but the workmen of the Ural Mountains, who use irons of remarkable purity, have often observed the same fact. Mr. Adamson has found that the metal becomes powdery at a temperature between 260° and 370° C. (500° and 698° Fah.), or the temperature at which willow twigs take fire.

This phenomenon seems to explain a large number of accidents, as, for example, the breaking of tires under the action of brakes and the fracture of riveted moulds and of machine arbors which become heated by friction.—*Ann. du Gen. Cie.*

THE Holly Manufacturing Company, of Lockport, N. Y., has opened a special office at 157 Broadway, under the charge of Mr. C. G. Hildreth, secretary of the company.

Curious Observations on Ants.

Sir John Lubbock lately read a paper on the subject at a meeting of the Linnæan Society. He said that in one of his former papers (Linnæan Society *Journal*, vol. xiv., p. 278) he had given a series of experiments made on ants with light of different colors, in order if possible to determine whether ants had the power of distinguishing colors. For this purpose he utilized the dread which ants, when in their nest, have of light. Not unnaturally, if a nest is uncovered, they think they are being attacked, and hasten to carry their young away to a darker, and, as they suppose, a safer place. He satisfied himself, by hundreds of experiments, that if he exposed to light the greater part of a nest, but left any part of it covered over, the young would certainly be conveyed to the dark portion. In this manner he satisfied himself that the different rays of the spectrum act on them in a different manner from that in which they affect us; for instance, that ants are specially sensitive to the violet rays. But he was anxious to go beyond this, and to attempt to determine how far their limits of vision agree with ours. We all know that if a ray of white light is passed through a prism, it is broken up into a beautiful band of colors—the spectrum. To our eyes it is bounded by red at the one end and violet at the other, the edge being sharply marked at the red end, but less abruptly at the violet. But a ray of light contains besides the rays visible to our eyes others which are called, though not with absolute correctness, heat rays and chemical rays. These, so far from being bounded by the limits of our vision, extend far beyond it, the heat rays at the red, the chemical rays at the violet end. He wished under these circumstances to determine if possible whether the limit of vision in the case of ants was the same as with us. This interesting problem he endeavored to solve as follows: If an ants' nest be disturbed the ants soon carry their grubs and chrysalises underground again to a place of safety. Sir John, availing himself of this habit, placed some ants with larvæ and pupæ between two plates of glass about one-eighth of an inch apart, a distance which leaves just room enough for the ants to move about freely. He found that if he covered over part of the glass with any opaque substance, the young were always carried into the part thus darkened. He then tried placing over the nest different colored glasses, and found that if he placed side by side a pale yellow glass and one of deep violet, the young were always carried under the former, showing that though the light yellow was much more transparent to our eyes, it was, on the contrary, much less so to the ants. So far he had gone in experiments already recorded; but he now wished, as already mentioned, to go further, and test the effect upon them of the ultra violet rays, which to us are invisible. For this purpose, among other experiments, he used sulphate of quinine and bisulphide of carbon, both of which transmit all the visible rays; and are therefore perfectly colorless and transparent to us, but which completely stop the ultra violet rays. Over a part of one of his nests he placed flat-sided bottles containing the above-mentioned fluids, and over another part a piece of dark violet glass; in every case the larvæ were carried under the transparent liquids, and not under the violet glass. Again, he threw a spectrum into a similar nest, and found that if the ants had to choose between placing their young in the ultra violet rays or in the red, they preferred the latter. He infers, therefore, that the ants perceive the ultra violet rays, which to our eyes are quite invisible.

Now as every ray of homogeneous light which we can perceive at all appears to us as a distinct color, it seems probable that these ultra violet rays must make themselves apparent to the ants as a distinct and separate color (of which we can form no idea), but as unlike the rest as red is from yellow or green from violet. The question also arises whether white light to these insects would differ from our white light in containing this additional color. At any rate, as few of the colors in nature are pure colors, but almost all arise from the combination of rays of different wave lengths, and as in such cases the visible resultant would be composed not only of the rays which we see, but of these and the ultra violet, it would appear that the colors of objects and the general aspect of nature must present to them a very different appearance from what it does to us. Similar experiments which Sir John also made with some of the lower crustacea point to the same conclusion, but the account of these he reserved for a future occasion. He then proceeded to describe some experiments made on the sense of direction possessed by ants, but it would not be easy to make these intelligible without figures. After detailing some further experiments on the power of recognizing friends, he gave some facts which appear to show that ants, by selection of food, can produce either a queen or a worker at will from a given egg. Lastly, he stated that he

had still some ants which he had commenced to observe in 1874, and which are still living and in perfect health; they now, therefore, must be more than seven years old, being therefore by far the oldest insects on record.

Naval Brass.

In the early part of 1874, in consequence of numerous cases of failure in respect to Muntz metal in ships of the Royal Navy, the attention of the Admiralty was drawn to the subject, and they directed inquiry to be made as to the cause of these failures. Mr. Farquharson, to whom the matter was referred, found that the causes of decay which had been suggested would not account for that which actually took place. In the numerous cases which came under his notice, two conditions of use were always observable, namely, salt water and contact with an electro-negative metal—a fact which pointed strongly to electro-chemical action as the cause of the change. On the other hand there was a total absence of surface-pitting. To the eye the surface of the affected bolts was as smooth and perfect as when they were first made. It was difficult to understand how an internal change, such as actually took place, could come to pass in the way inferred. Fortunately a very simple expedient proved beyond doubt that salt water had penetrated an apparently sound and close metal, and the mystery was thus dispelled. Bolts 3½ inches in diameter, which had been used for securing propeller blades, were shown to have been thus penetrated to the center. In view of these facts, the conclusion that a portion of the zinc had been dissolved out was inevitable, and this explanation has been thoroughly verified by comparing analyses of affected and unaffected parts of the same bolts.

The circumstance that no such change as that to which we now refer was to be found in any of the numerous varieties of gun metal, rendered it probable that it was peculiar to alloys of copper and zinc, so that if a forgeable metal could be produced with tin in its composition, having the requisite strength and ductility, the alloy thus formed would be free from the defect complained of. In the latter part of the year 1874 an alloy, composed of 62 parts of copper, 37 of spelter, and 1 of tin, was proposed by Mr. Farquharson, as possessing the requisite mechanical properties. The Admiralty thereupon referred the question as to the endurance of such metal to Dr. Percy, of the Royal School of Mines, in conjunction with Mr. Farquharson. These parties, after subjecting an alloy of this description to severe tests, under which the Muntz metal completely failed, reported to the Admiralty in 1879 that the new compound had stood the test satisfactorily. Accordingly it was adopted as the service alloy under the title of "naval brass." The process of manufacture is the same as for yellow or Muntz metal. To insure the best results, Australian or English B.S. copper should be used, and the proportions of metal stated above closely adhered to, due allowance being made for the loss of zinc in the process of melting. When finished cold, and left unannealed in rods and sheets of moderate thickness, the metal has a tensile strength of from 67,000 pounds to 72,000 pounds per square inch, according to the amount of rolling it has received. Bolts of any size can be made of it, the usual practice being to take a rod the size of the bolt required, and to form the head by upsetting in a die. This is done without stress or injury to the metal in a bolt or rivet-making machine, with heads two diameters of the bolt.

The new alloy is specified for all ships built for the Admiralty, and the details now given may be of service to contractors and others using naval brass. The metal, not being fusible until above a red heat, gives promise of being valuable as linings to main brasses of engines and for other purposes where white metal is now used, and we understand that arrangments are in progress for testing its value under such conditions. The result will be awaited with interest by many who have experienced the need of a good bearing metal.—*The Engineer.*

Heating Effects due to Compression.

On two former occasions we have taken notice of the results of certain experimental investigations instituted by Professor P. G. Tait, of the University of Edinburgh, in regard to the thermometers used in the Challenger expedition, and the alleged effects of compression upon them when immersed to great depths in the sea. Still pursuing the line of inquiry suggested by the experiments made with these thermometers, the learned professor has since made a further series of experiments on the heating effects of compression of a number of liquids and semi-solid liquids, the results of which he laid before the Royal Society of Edinburgh on the evening of Monday, May 16. He mentioned that he had employed a ton pressure upon each of a number of different substances, and had noticed in each case the rise of temperature due to the compression exerted. Marine glue gave a rise of temperature to the extent of 0·9° Fah.; raw potato, 0·7°; pith, 0·37°; cork, 1·3°; a piece of bar soap, about one-twentieth of a degree; a piece of licorice and a piece of cheese, about three-quarters of a degree; a piece of raw flesh behaved very much like the potato; India-rubber and solid paraffine rose in temperature about 1½°; lithographer's ink and shoemaker's and bees' wax, about 1·4°; lard, about 2°.

After mentioning these details, Professor Tait said it was remarkable that potato and raw flesh, with so large a percentage composition of water, had a large comparative amount of independent heat produced, while pith gave no perceptible difference of effect over what would have been produced by water alone. Cork had this peculiarity, namely, that when the pressure was removed the fall of heat was only 0·9° Fah., as against 1·3° of a rise on the application of the same amount of pressure. That seemed to agree, he said, with what was already known of cork, namely, that on the removal of the pressure it did not spring back to its original form. In these respects India-rubber was opposed to cork, which had this further peculiarity, that, on continued experiment, the amount of heat produced by the pressure gradually fell till it was the same as the amount of cooling which resulted on the relaxation of the pressure. About shoemaker's wax there was the peculiarity that it took a very long time before the heating effect was fully produced. Its chemical composition, also, was of course different from that of beeswax, which yet had precisely the same amount of heat produced. In concluding his interesting communication, Professor Tait intimated that further research would be necessary before they could get definite facts showing the exact heating effects of compression, which, he added, would form the subject of a future communication.—*Engineering.*

The Curse of Poor Printing.

Short-sightedness, or myopy, is increasing to an alarming extent among civilized nations. It is commonly supposed that only a few persons are thus afflicted, but the truth is that a large portion of every community is more or less troubled with imperfect vision. Myopy among school children and attendants at higher institutions of learning in this and other countries has been thoroughly investigated by Prof. Hermann Cohn and a number of other eminent oculists, who have examined in all more than forty thousand scholars. The facts they have gathered deserve the most serious consideration.

The general conclusions arrived at by all the investigators have been formulated by Prof. Cohn, as follows: "1. Short-sightedness hardly exists in the village schools—the number of cases increases steadily with the increasing demands which the schools make upon the eyes and reaches the highest point in the gymnasia. 2. The number of short-sighted scholars rises regularly from the lowest to the highest classes in all institutions. 3. The average degree of myopy increases from class to class—that is, the short-sighted become more so." It was found that in the village schools scarcely one per cent, in the elementary schools five to eleven per cent, in the girls' schools ten to twenty-four per cent, in the real schools twenty to forty per cent, and in the gymnasia between thirty and fifty-five per cent of the pupils are myopic. In the prima of several German gymnasia more than sixty per cent of the students are myopic, at Erlanger eighty per cent, and at Heidelberg not less than one hundred per cent. Examination of university students has so far been made only at Breslau and Tübingen, where, in 1867, Prof. Cohn found that fifty-three per cent among the Catholic theologues were short-sighted, fifty-four per cent of the law students, fifty-six per cent of the medical students, sixty-seven per cent of the evangelical theologues, and sixty-eight per cent of the students of philosophy. Some nationalities are much more troubled by the affection than others. For instance, in New York twenty-seven per cent, and in Boston twenty-eight per cent of the pupils in the gymnasia were found to be myopic, while at Tiflis thirty per cent of the Russians, thirty-eight per cent of the Armenians, and forty-five per cent of the Georgians were near-sighted.

Prof. Cohn cites among the principal causes of myopy, badly constructed school benches, bad writing, and bad type. The latter evil he says deserves especial attention, and for remedying it he makes some valuable suggestions, of which the following are the most important:

"The most important point is the size of the letters. We cannot determine this by the measurement of the em, as the printers do, for that regards the shank of the type, of which readers know nothing; but it must be judged by a special measurement of the visible letter. I have adopted as the standard of measurement the letter n, that being the most regular and symmetrical in shape in both the Roman and German alphabets. I have found that the n in pearl type is about three one-hundredths of an inch high, in nonpareil about one twenty-fifth of an inch, in brevier about one-twentieth of an inch, in long primer one-seventeenth inch, and in pica one-fourteenth inch. We have hitherto had no definite rule concerning the smallest size of letters which should be permitted for the sake of the eyes. The distance at which a letter of any particular size can be seen does not afford a guide to it, for it does not correspond at all with the distance at which matter printed in the same type can be read steadily at the usual distance in reading. I believe that letters which are less than a millimeter and a half (one-seventeenth inch) high will finally prove injurious to the eye. How little attention has hitherto been paid to this important subject is exemplified in the fact that even oculistic journals and books frequently contain nonpareil, or letters only a millimeter (one twenty-fifth inch) high. Many of the text books required by the school authorities are badly printed. The officers should go through every school book with a millimeter rule in their hands, and throw out all in which the letters are less than a millimeter and a half high, and should give the preference to those establishments which do not use letters of less than two millimeters (one-thirteenth inch). The distance between the lines is an important factor in respect to ease in reading. As is well known, the compositors often insert thin leads between the lines so that the letters which project above the average height and those that fall below the line shall not touch. Every one knows that legibility is improved by contrast; the darker the print and the clearer the paper, so much easier is the reading. When the lines are close together, or the matter is printed 'solid,' the eyes become tired sooner, because the contrast is lessened. The lines tend to run together, and the effort to separate them strains the eyes. In fine editions the lines are widely separated. I consider a book well leaded in which the interlinear space, measured by the shorter letters, amounts to three millimeters (one-eighth inch). The lines will really seem to be closer, for the projections of the longer letters will encroach upon the interlinear space; and cases may occur, where those letters predominate, in which the space may seem to be only one millimeter. The narrowest interval that should be permitted is, in my opinion, two and a half millimeters (one-tenth inch)."

In view of the formidable statistics we have given in regard to the prevalence of short-sightedness, it is evident, says the *Paper World*, that everything which will tend to lessen the evil should be undertaken without delay. Neglect in this matter will result in everybody's wearing glasses, and in seriously impeding the performance of all the world's work, especially those branches that particularly require the exercise of good eyesight. In the matter of printing, especially, reform is called for. There is no reason why small type, or type arranged in lines having inadequate space between them, should be tolerated, and the public should stoutly refuse to countenance the use of any school books or patronize papers and periodicals that are printed without regard to the best interests of the students' or readers' eyes.

[It is pleasing to know that the size of type and general style of printing still used, and first adopted by the SCIENTIFIC AMERICAN thirty years ago, are now recommended, by eminent authorities, to be the best standard for eye health. Our paper has always been regarded by printers and readers as a model for typographical excellence; hundreds of periodicals, at home and abroad, have followed it as a pattern. But the particular reasons why typography like that of the SCIENTIFIC AMERICAN has proved so satisfactory and popular, have perhaps never before been so clearly explained with measurements as by Prof. Cohn in his statement above given.]

The Examination of Food and Drugs.

The "Act to Prevent the Adulteration of Food and Drugs," lately passed by the New York Legislature, has been approved by the Governor. It provides that the State Board of Health shall take cognizance of the interests of the public health as it relates to the sale of food and drugs and their adulteration, and make all necessary investigations and inquiries relating thereto; and penalties are provided for any offenses calculated to impair the strength, quality, or purity of substances used as food or medicine.

The sanitary committee of the State Board met in this city July 6, and appointed, under the act, Drs. C. E. Munsell and A. L. Colby, of New York city, and Dr. T. Delap Smith, of Fulton county, as inspectors, to collect food for analysis. The examination of samples will be made by the following named chemists:

Dr. S. A. Lattimore, of the University of Rochester, to examine canned food and spices. Dr. Pitt, of Buffalo, to examine sugar, glucose, sirups, molasses, confectionery, honey, soda water sirups, and ice cream. Dr. Cauldwell, of Ithaca, to examine butter, cheese, lard, and olive oils. Dr. Englehart, of Syracuse, to examine wine, beer, spirits, and cordials. Drs. Lattimore and Hoffman, to examine tea, coffee, and cocoa. Dr. Cauldwell, to examine chemicals as met in pharmacy, quinine and its preparations, ether, and fruit essences. Dr. Chester, of Hamilton, to examine meat extracts, fish and fish extracts, and gelatine. Dr. Hoffman, to examine vegetable and animal drugs and all pharmaceutical preparations. Dr. Love, of New York city, to examine cereals, grain products, artificial cereals for the use of invalids and children, baking powders, and all chemicals used in baking. Dr. Chandler, to examine milk and its preparations.

Nitrates in Nevada.

An extremely important addition has lately been made to the list of valuable minerals found in Nevada. It consists in the discovery of large beds of nitrates near Brown's Station, Humboldt Desert. The State Mineralogist of California, Mr. H. G. Hanks, finds the mineral to be a very rich nitrate of soda, and regards the discovery as one of the most important ever made on the Pacific Coast. Mr. Hanks expresses the opinion that other similar deposits will be found, as large regions of Nevada and California are of a formation suitable for its existence. Many years ago he predicted the discovery of nitrates in the southern part of California, but as yet none has been found. The Nevada discovery will doubtless turn the attention of prospectors to this valuable mineral.

Hydraulic Mining in California.

The question of mining *débris* and the preservation of river bottoms endangered by the "slickens" and "tailings," deposits from hydraulic and other mines, has been brought before the courts in an action begun by the State Attorney-General against the Miocene Mining Company, praying that the Mining Company be restrained from discharging into the Feather River any dumpings or tailings. The desired injunction has been granted by Judge Denison, Superior Court, Sacramento county, Cal.

QUARTZ AND MARL AS WOOD FILLERS.

A very interesting law suit was decided not long ago by Judge Shipman, U. S. Circuit Court, Connecticut, in which the various processes of finishing and varnishing fine woods, and the values of fillers for that purpose, were elucidated. The suit was for infringement, brought by the Bridgeport Wood Finishing Company, owners of Wheeler's quartz filler patent of January 18, 1876, against Hooper. The latter denied the infringement, and showed to the court that he was working under a patent similar to Wheeler's, for a filler issued in 1856, or twenty years prior to the date of the Wheeler patent. It both cases it appeared that the basis of the filler is the same, namely, oxide of silicon or quartz. This curious question, therefore, appears to have presented itself: How can the use of a patent granted for an oxide of silicon filler, granted in 1856, infringe a patent for an oxide of silicon filler not granted until 1876? This is answered and much valuable information given in the following extracts from the decision of the court:

In the cabinetmaker's art, says Judge Shipman, it is necessary that the grain or the pores of the wood upon the surface should be filled with some material in order that the surface may be smooth, resist moisture, and receive a permanent polish. Divers materials and combinations of materials, such as beeswax, copal, starch, pumice-stone, plaster of paris, and various gums have been used, but all proved ineffectual. They absorbed the varnish which was used for polishing, shrank, rolled out, or discolored the wood.

What was needed was a non-absorbent transparent article which would fill the pores and make a permanent, hard, smooth surface. The process of finishing cabinet work without the use of a filler involved a large expenditure of money and of time. It is described by the patentee as follows:

"I found [in the Wheeler & Wilson Company's finishing department] the system or process of finishing to be, first, as the work came from the cabinetmaker, to give it a heavy coat of oil, to let that dry a week or more, then sandpaper the work with boiled linseed oil until the gum of the oil, the fiber of the wood, and the sand that came off the sandpaper produced a sort of gummy paste, which, in the process of rubbing, would lodge in the open pores of the wood, and which required much time and hard rubbing to fill the grains passably. This gum, being composed of oil, required much time to dry; otherwise, if varnished before it was dry it would shrink in drying and crack and displace the varnish. This was the process for finishing all the ordinary work. The finer quality of work, known as 'hand-polish finish,' required to be varnished with from three to five coats of what is known as 'scraping varnish,' which, when dry, was scraped off with a cabinetmaker's steel scraper, leaving none of the many coats of varnish on the work except that in the grains of the wood below the surface, after which from three to five coats of polishing varnish were applied. Then the work was rubbed down with pumice stone and water and polished up with rotten-stone and the hand, the palm of the hand bringing the polish up. This process is the same as heretofore used by all piano makers in the country."

The invention and the difficulties which it was intended to obviate are thus described in the specification:

"Heretofore various materials have been used to fill the grain in processes of finishing woods, such as pulverized marl, clay, flour, chalk, starch, and different gums, but all are found to have objectionable features in use, which my new process is designed to obviate. In some of the substances employed the particles when powdered are round or spherical and without angles, and consequently do not readily adhere to each other and unite with the pores of the wood, and others are wanting in durability and subject to injurious atmospheric action.

"I am also aware that various forms of infusorial silicates have been used in mixtures for filling the grain of wood, but these are all very powerful absorbents of liquids and carry the moisture by the quality of their capillarity into the wood itself, which has to be removed by evaporation before the varnish can be applied to the surface of the wood, and which opens the pores when said moisture is evaporated and prevents it from being solidified or producing a hard or smooth surface ready for the varnish.

"I use finely powdered flint, quartz, or feldspar, which are non-absorbents of moisture or liquid of any kind, and which fill the pores of the wood by the particles packing together similar to a concrete, and which are combined with any fluid substance that will permit their being rubbed into the surface, such as oil or varnish or other similar fluids. The finely powdered flint or quartz being so mixed to about the consistency of jelly, and colored, if desired, to match the wood to be filled and polished, I apply the mixture with a pad of cloth or leather to the wood and rub it into the pores until they are full, when, by a little continuous rubbing, the surplus material will adhere to the pad or cloth until the whole surface of the wood is cleaned off, leaving the pores of the wood entirely packed, and when dry presenting a smooth, hard, and glassy surface of great durability, upon which one coat of varnish will produce all the finish desired for fine furniture."

The claim is—

"In the art of filling wood, the employment of finely powdered flint, quartz, or feldspar, mixed with oil or other fluent substance, substantially as described."

The invention has proved to be a great success, the filler has gone into extensive use, and has effected a very large saving of time and expense in the manufacture of furniture, and is used upon the finest work. It makes a hard, permanent, and glassy or transparent surface, impenetrable to oil or moisture, leaves the wood in its natural color, and requiring the application of but a single coat of varnish. The reasons of its superiority consist in its non-absorbent quality and mainly "in the peculiar nature of the ground quartz. The particles, being angular, sharp, and, I might say, needle-pointed, they readily enter into and unite with the fiber of the wood, and when once united with the fiber of the wood it is impossible to displace them; and when large orifices require to be filled the particles readily pack one upon another and become permanent and solid." The jelly-like mixture of oil and varnish with the quartz forms, when rubbed into the pores of the wood, "a hard, impenetrable substance, which in itself forms a protection to the wood."

The defendants made and sold, prior to the date of the bill and after the assignment of the patent, wood-filler which is substantially the plaintiff's article, and, like the plaintiff's, made from powdered quartz. It is not denied that the manufacture and sale of this material is an infringement of the plaintiff's patent.

The principal defense is that the defendants had the right to use the material under a license from James Perry, to whom was granted a patent, dated September 11, 1856, which, it is claimed, includes the Wheeler patent. The claims of the Perry patent are:

1. The use of silicious marl or infusorial earth for the purpose of filling and polishing wood, substantially as herein set forth.

2. The combination of silicious marl with any or all of the substances herein named—sulphate of zinc, muriate of ammonia, gum-arabic, gum-tragacanth, and oil—substantially in the manner and for the purpose herein set forth.

The theory of the defendants is this: Flint and quartz are chemically silica more or less pure, or what is known to chemists as "silicic acid." Feldspar is a silicate of alumina and potash, and contains silica in large quantities. Quartz and flint contain from eighty-five to one hundred per cent of pure silica. Infusorial earth is a fine grained earth formed by the deposition of the silicious coatings or shells of microscopic plants, called "infusoria," on the bottom of ponds or lakes of water, and is mostly silica mixed with carbonate of lime and other impurities. Silicious marl is a mixture of clay and carbonate of lime and silica in the form of sand or infusorial shells. Silicious marl contains from twenty to fifty per cent of silica. As, therefore, quartz or flint contains from eighty-five to one hundred per cent of silica, and infusorial earth and feldspar are mostly silica, and silicious marl contains fifty per cent of the same chemical substance, a grant of the exclusive right to use infusorial earth or silicious marl gave also the right to use quartz, flint, or feldspar, the five articles being substantially silica.

The sufficient answer to this theory is that, acknowledging the facts which have been stated to be true, and that these articles are chemically very similar, yet practically for use in the arts the respective classes of articles which are named in the two patents possess very different properties. Infusorial earth is a vegetable tissue, "porous and delicate in structure," friable, and of chalky texture, and not possessing the hardness and sharp angles and needle-like points of powdered quartz, flint, and feldspar, qualities which cause the quartz, flint, or feldspar to find a permanent lodgment in the pores of the wood and thoroughly fill them, so that a new, hard, unabsorbent surface is formed.

As charcoal and the diamond are alike chemically composed of carbon, yet are very different substances in the arts, and are used for different purposes, so quartz and infusorial earth, though chemically similar or substantially identical, are dissimilar in the uses to which they are adapted. Infusorial earth, though chemically silica, is unfitted for the purposes of filling wood, for the reasons which render chalk or starch unfitted, while powdered quartz has been found to possess qualities which make the plaintiff's article the only efficient and useful filler known to the cabinet manufacturers of the country.

Silicious marl is as ill adapted as infusorial earth, because, while marl contains more sand than is found in infusorial earth, yet the sand is in rounded and not angular grains. Feldspar breaks, like quartz, into angular fragments, and is also non-absorbent.

The chemical character of the articles named in the two patents and the differences for practical use between the two classes of articles are terseiy and clearly stated in the following extract from the testimony of Professor Samuel W. Johnson, one of the experts called by the plaintiff. Professor Johnson testified:

"Quartz, chemically, is oxide of silicon. It contains no hydrogen and yields no water when heated. Its specific gravity is 2·65. It will not readily dissolve in a boiling aqueous solution of potash or soda, even when finely pulverized. This specimen of infusorial earth, Exhibit 'M,' which consists very largely of the skeletons of microscopic plants, is chemically oxide of silicon plus water, and when heated gives off several per cent of water. Its specific gravity is less than that of quartz. It is softer than quartz. It dissolves with the greatest ease, to a large extent, in a boiling aqueous solution of potash or soda. It is, therefore, chemically distinct from quartz, and is classed by mineralogists with the opal, as a mineral species distinct from quartz.

"Again, the quartz powdered as specified in the Wheeler patent is seen under the microscope to consist of sharp, angular particles, which, when applied to the surface of wood by rubbing with a cloth or leather pad, are forced into the pores of the wood, where they firmly lodge and effectually fill these pores with an impervious material. The hardness of quartz is such that in the process of filling its particles are not further pulverized to any appreciable extent, but are simply forced into the wood, from which they cannot be easily dislodged. Infusorial earth, on the other hand, is friable under pressure and friction, and has a chalky rather than a gritty texture. It presents no angular fragments which can be rubbed into the pores of the wood so as to fill them with an unabsorbent material. Quartz is a crystallized silica of a mineral origin, and, in common with all crystals of such origin, has no porosity that can be detected by the highest magnifier, and is in mass absolutely impenetrable to water, oil, or other similar liquids. Infusorial earth, on the contrary, is a hydrated silica that has been organized into the structure of a plant, and, in common with all vegetable tissues or organized structures, is porous and delicate in structure, so that in respect to texture, hardness, sharpness, it is quite the opposite of powdered quartz in its application as a wood filler."

The sand or silica found in silicious marl is chemically identical with pulverized quartz, "inasmuch as both consist of oxide of silicon or quartz, but, physically and practically, for the purposes of wood filling, different, because the sand, mixed with infusorial earth, being a geological sediment, consists of rounded water-worn grains, while powdered quartz of the Wheeler patent consists of angular, sharp-edged fragments and splinters."

The Wheeler patent was accordingly sustained.

MECHANICAL INVENTIONS.

Messrs. Francis Seymour and Augustus Bannigan, of Paterson, N. J., have patented an automatic stop-motion for spinning-machines, whereby the operation of the machine is arrested if a thread breaks. It is more particularly an improvement in the class of silk doubling and spinning machinery in which a faller-wire is hung by its eyelet end to the thread, and with the breakage of the latter falls upon the arm of a balance-lever and actuates a detent. In this invention the action of the spinning and doubling devices is arrested when a thread breaks by the depression of a spring-lever, which operates by gravity upon other devices so arranged as to raise or depress the bands of the several spindles, and thus shift them from fast to loose whirls or pulleys. Simultaneously with this operation and result the doubled thread is removed from between the drawing rolls by the action of the doubling device, which is suitably connected with the band shifters.

Intermittent Luminous Signals.

In the ordinary use of lamps for lighthouse signals the intermittences are produced by a diaphragm which moves before the light, so that the fuel is wasted during the eclipses. At present the average waste of light is about 65 per cent, but if a signal was sent twice a minute, sufficient to indicate the first two letters of the lighthouse, there would be a waste of about 90 per cent. In order to remedy this extravagance Mercadier proposes to adopt a Dubosq lamp with a round wick and a tube in the center of very small diameter, through which a jet of oxygen can be discharged upon the top of the wick. In spite of the high temperature of combustion, the lamp does not heat much; it consumes little petroleum, and the wick does not crust. Therefore it will operate for many days without being trimmed or filled anew. The intense flame is produced by the combustion of petroleum vapor at the center of the jet, and the surrounding film of air being a bad conductor the lamp heats only at the top of the burner. The oxygen is inclosed in a reservoir, under suitable pressure, which in his apparatus does not exceed 4 millimeters (0·157 inch) of mercury; it first passes through a manipulator, which has a form similar to that of the key of a Morse instrument, traversing a caoutchouc tube, which is pressed together when the key is at rest. Upon depressing the key the pressure upon the tube ceases, and the oxygen reaches the flame; when the key is released the oxygen jet is stopped. In this manner the flow of oxygen is manipulated as simply as the electric current in the Morse system. The rapidity of manipulation is more than sufficient for all the requirements of optical telegraphy. A method somewhat similar has been contrived by Mercadier for the electric light.—*Compt. Rend.*

Decomposition of Light by a Wheel.

It occurred to me that light might be decomposed by interrupting, with a reflecting surface, a ray of light in such a manner that the interruptions may be proportional to the wave length period of any particular ray forming a part of a composite ray. The experiment is effected in the following way:

A wheel, having bright spokes (the large wheel of a bicycle answers well) is caused to revolve between an observer and the sun, so that a ray of light is reflected to the observer by a bright spoke; then, when 120 spokes pass before the observer per second, violet light shines out vividly; when 65 pass red appears, and different rates of revolution give different colors. There seems to be a marked relationship existing between the number of spokes which pass by and the wave-length of the two colors mentioned, that of the violet being one sixty-thousandth of an inch, and that of the red one thirty-four-thousandth of an inch.

I am now investigating this apparent relationship between spoke interruption and wave length for the other colors of the spectrum of white light, and I hope to be able to make known the results shortly.—*Frederick J. Smith, in Nature.*

Business and Personal.

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

Wanted—Good Boiler Floats. Box 498, Bellevue, Ohio

Acker, Merrall & Condit sell Van Bell's "Rye and Rock" to the trade and at retail.

The Common Sense Dry Kiln prevents check, warp, or hardened surface. See St. Albans M'f'g Co.'s adv. p. 60.

Wanted.—Responsible parties to make and sell on royalty an improved Sash holder. J. Lynch, 52 Suffolk St., Lowell, Mass.

Luminous Paint or Varnish for Clocks, Watches, Signs, etc. Sent by mail for $1 a package. James Pool, Mt. Carmel, Ill.

Your boiler is predisposed to weakness by thickening of the water or burning of the iron caused by impurities in feed water. They should be removed by Hotchkiss' Mechan. Boiler Cleaner. 84 John St., N.Y. Circulars free.

Moulding Machine.—For Sale, No. 1 12-inch 4-roll 4-side S. A. Wood's Inside Moulder, in good condition. Belcher & Bagnall, 40 Cortland St., N. Y.

For Sale.—Turret Lathe, with Chaser Bar. No. 1 and 4 Root Blowers. B. & W., 261 N. 3d St., Phila., Pa.

Patent for Hoisting Apparatus illustrated on page 38, current volume of SCIENTIFIC AMERICAN, is for sale. Address Geo. Speidel, 833 Buttonwood St., Reading, Pa.

J.J.Callow's new grain'g and letter'g catal'g, Clevel'd, O.

Tarred Roof'g, Sheath'g Felts. Wiskeman, Paterson, N.J.

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

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

List 26.—Description of 2,500 new and second-hand Machines, now ready for distribution. Send stamp for the same. S. C. Forsaith & Co., Manchester, N. H.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Punching Presses & Shears for Metal-workers, Power Drill Presses, $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N. Y.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

Pure Oak Leather Belting. C. W. Amy & Son, Manufacturers, Philadelphia. Correspondence solicited.

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

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

For Machinists' Tools, see Whitcomb's adv., p. 12.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

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

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N.Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Clark Rubber Wheels adv. See page 28.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad., p. 29.

Safety Boilers. See Harrison Boiler Works adv., p. 29.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 29.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 28.

For Sequeira Water Meter, see adv. on page 30.

Cope & Maxwell M'f'g Co.'s Pump adv., page 45.

The Sweetland Chuck. See illus. adv., p. 46.

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

Skinner's Chuck. Universal, and Eccentric. See p. 46.

See Bentel, Margedant & Co.'s adv., page 61.

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

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

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

Telegraph, Telephone, Elec. Light Supplies. See p. 62.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wares, notions, and novelties in the above line, a specialty. See advertisement on page 62.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Gould & Eberhardt's Machinists' Tools. See adv., p. 62.

The Medart Pat. Wrought Rim Pulley. See adv., p. 61.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 61.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 28.

Barrel, Keg, Hogshead, Stave Mach'y. See adv. p. 61.

For best Duplex Injector, see Jenks' adv., p. 60.

Renshaw's Ratchet for Square and Taper Shank Drills. The Pratt & Whitney Co., Hartford, Conn.

Walrus Leather, Walrus Wheels, Pure Turkey Emery Star Glue for Polishers. Greene, Tweed & Co., N. Y.

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

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

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 61. Totten & Co., Pittsburg.

Improved Skinner Portable Engines. Erie, Pa.

4 to 40 H. P. Steam Engines. See adv. p. 61.

Green River Drilling Machines. See ad. p. 45.

Blake's Patent Belt Studs. The strongest fastening for leather and rubber belts. Greene, Tweed & Co., N.Y.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

(1) J. H. writes: 1. I want to make a cylinder of sheet platinum. Can you tell me how I can make the necessary joints so that they will stand intense heat? A. Platinum can be welded upon itself at a high temperature. The metal can be heated hot enough in a good forge fire. It should be embedded in quicklime to protect it from the carbon. 2. Is Professor Dolbear's telephone patented? Your article last week did not state so. A. Yes.

(2) W. H. C. says, *in answer to* B. W. B., page 409 (4), vol. xliv.: "According to Hager, the 'Encre pour les Dames' (ink for ladies), characters written with which fade out in about four weeks, consists of an aqueous solution of iodide of starch."

(3) E. S. asks for a receipt for making a first class shoe blacking. A. See page 218 (15), vol. xliv. 2. How can I dye glass a blue or red shade? A. Colors are usually imparted to glass in the melting pot: for blue, oxide of cobalt is used; for red, sub-oxide of copper or gold. Glass is stained by painting its surface with a fusible colored glass ground to a fine powder and mixed up with gum water or turpentine, and after drying then heating the painted glass in a furnace until the coating fuses. Collodion, shellac, or spirit copal varnishes, properly colored with one of the coal tar dyes, can in some cases be advantageously employed as a colored wash for white glass.

(4) J. G. P. asks how to dye blonde hair to a light brown. A. The expressed juice of green walnut shells diluted with water is used for this purpose.

(5) C. F. P. asks: How can elastic rubber be melted so as to be run into moulds? A. Rubber cannot be melted as you propose. It decomposes at a temperature high enough to melt it. Pure, unvulcanized gum rubber (caoutchouc) can, however, be softened by a gentle heat (or by hot water) so as to admit of moulding with pressure.

(6) J. E. asks: Is there any process known for hardening oils, say, for instance, tar oils, to thickness of paste, without boiling or soap? A. We know of no way of thickening tar oil or similar oils except by adding to them a sufficient quantity palm oil, lard, or other solid or semisolid substance.

(7) E. H. writes: Please state the difference in your paper of benzine, benzole, naphtha, and methyl alcohol. A. Naphtha and benzine are light products of the distillation of petroleum; the former has the lowest specific gravity. Benzole proper, is one of the distillates of gas tar. Methyl alcohol, or wood naphtha, is an alcohol obtained as one of the products of the destructive distillation of wood.

(8) T. K. writes: I am doing some work in a building where there is a radiator 75 feet long, 10 pipes high, made of 1 inch pipe with a header on each end; it is provided with air valves, and has one-eighth of an inch descent to the foot, and yet it is constantly air bound. It is supplied with steam through a 1¼ inch pipe and drained by a 1 inch pipe. If I cut this radiator and make two radiators of it will it remedy this trouble? A. We think cutting and giving the pipes more descent would be effective. 2. Can steam pipes have too much descent? A. No, provided they be kept clear of water.

(9) P. R. writes: 1. I have made a Holtz electrical machine from directions in SCIENTIFIC AMERICAN, No. 16, and SCIENTIFIC AMERICAN SUPPLEMENT, No. 278. I followed directions, and the mechanical part is well done, but I am unable to charge it or to get any trace of electricity. If I have made any mistake it must be about the paper inductors, as I had at first inductors only on the posterior face of the stationary disk and gilt paper on outside of inductors; but I altered in accordance to your answer to G. W. G., query 29, in SCIENTIFIC AMERICAN, June 18, with no better result. A. With the most perfect of Holtz machines it is impossible to generate a current in the warm sultry days of summer unless the plates are warmed and kept dry. It is probable that your machine would work well any time after August and before May. If you try it every day through the summer you will discover that it will work on some days quite well and at other times not at all. 2. If the ends of the two paper inductors are flush with the edge of the hole or window, and the two projecting serrated ends of the gilt paper to reach the center of the window, are these two serrated ends to be left apart or pasted together? A. They are pasted together. 3. Please explain the action of the cross arm, G. A. The cross arm equalizes the charge on the revolving plate and prevents carrying the negative charge to the positive inductors, and prevents the positive charge from being carried to the negative inductors.

(10) W. M. asks: Which will stand exposure to the weather, the best zinc or best quality of marble? A. Zinc (if pure), under ordinary circumstances.

(11) F. A. H. asks: 1. In estimating the evaporative capacity of steam boilers, is the surface of the furnace sheets considered more effective than the surface of the flues? If so, what is the accepted ratio? A. Yes, four to six times more effective. 2. In estimating the surface of the flues or tubes, is the internal or external surface to be considered as heating surface? A. External, or water surface. 3. What proportion of the flue or tube surface is considered effective? A. From 25 to 40 feet heating surface to one of grate, depending upon diameter of flues or tubes and length. 4. What is the usual allowance of effective heating surface per horse power? A. From 10 square feet in plain cylinder boilers, 12 square feet in flue boilers, and 15 to 17 feet in tubulars. 5. What are some good reliable books on the subject of boilers? A. "Barr on Steam Boilers" would suit you.

(12) G. A. G. writes: 1. I have SUPPLEMENT, No. 252, on telescopes. Will the terrestrial eyepiece, Fig. 7, used with an achromatic object lens, answer for astronomical purposes, as well as the meniscus lens and the eyepiece described and figured on pp. 4015? A. The terrestrial eyepiece is not so powerful as the astronomical eyepiece, but it may be used for astronomical observations. The achromatic objective is to be preferred for all purposes. 2. Please give the dimensions of focal lenses for astronomical eyepiece. A. This information is given in full in the article referred to.

(13) H. W. B. asks: 1 How many cells of gravity battery I need to run the simple electric light mentioned in SCIENTIFIC AMERICAN, vol. xli., No. 18, November 1, 1879, page 274? A. The gravity battery is not adapted to electric light. Use 12 to 18 cells of Bunsen's battery. 2. Also please give simplest mode of making carbon plates or pencils from gas retort carbon. A. Select bright clean coke and pulverize it finely. Mix with it a small proportion of finely ground bituminous coal and ram into a mould. Put the mould into an iron box, and surround it with coke dust. Seal the box with clay, and heat to a red heat in a muffle for several hours. When cool soak in thin treacle and bake as before.

(14) A. B. F. asks: 1. Who or what nation or race of people adopted the present mode or style of making figures as is in use generally? The Romans, I suppose, were the originators of the letters for figures. A. Ancient Indians (of Hindostan). 2. Who was the originator of the higher branches of mathematics (algebra, etc.)? A. The originators of the figures. The systems were improved by Descartes, Newton, Leibnitz, Laplace, Euler, and others. 3. How many comets are visible at this time? A. One. 4. Will you please give a good receipt to make sherbet. A. Sherbet is simply lemonade.

(15) E. P. writes: 1. I am building an engine the cylinder of which is 2¼ inches by 5 inches. What horse power will it be? How do you find the horse power of an engine? A. See SUPPLEMENT, No. 253, for this information. 2. What size boiler will the engine need? A. A boiler with about 100 square feet heating surface, say, vertical tubular, 32 inches diameter by 46 inches high. 3. What size boat will it drive? A. 26 to 28 feet length by 5½ feet beam. 4. What will be the size and weight of the screw or propeller needed? A. 26 inches to 30 inches diameter by 33 inches to 36 inches pitch. 5. At what speed will it drive a boat of proper dimensions per hour? A. Probably seven miles.

(16) O. R. M. wants a good process of making vinegar quickly. A. What is known as the German process is the most rapid method of making a good vinegar. In this, dilute alcoholic liquor to which one one-thousandth part of honey or extract of malt has been added is caused to trickle down through a mass of beech wood shavings previously steeped in vinegar and contained in a vessel called a vinegar generator (*essigbilder*). It may consist of a large oak hogshead or barrel furnished with a loose lid or cover, a few inches below which is fitted a perforated shelf, having a number of small holes loosely filled with packthread about six inches long, knotted at the upper end to prevent their falling through. Several small glass tubes long enough to project slightly above and below the shelf are also fitted in perforations in the shelf to serve as air vents. The vessel at the lower part is pierced with eight or ten holes equally distributed around the sides at about six inches above the bottom, to admit of the entrance of air. A small siphon tube, the upper curve of which is an inch below the air holes, serves to carry off the liquid as fast as it accumulates at the bottom. The alcoholic liquid at a temperature of 75°—85° Fah., is run in on the shelf, and slowly trickles down through the holes by means of the packthread, diffuses itself over the shavings, slowly collects at the bottom, and runs off by the siphon exit. The air enters by the lower holes, passes freely through the shavings, and escapes by the glass tubes. The temperature within the apparatus soon rises to about 100° Fah., and remains stationary at this point while the action goes on favorably. The liquid generally requires to be passed three or four times through the cask before its acetification is complete.

(17) G. F. M. asks: What is the capacity of the Corliss engine used in Machinery Hall at the Philadelphia Centennial, also that of the Sound steamer Providence, and of the largest ocean steamer running into New York—I mean the nominal horse power? A. The Centennial engines were 40 inches cylinder and 10 feet stroke, and called 500 horse power. The Providence is 110 inches cylinder by 14 feet stroke, about 2,000 horse power; the new Cunard steamer Servia, it is expected, will develop 10,000 horse power. There are several Transatlantic steamers that develop over 5,000 horse power.

(18) S. M. writes: We wish to make a covering for stacks of grain or hay, etc., and we saw an article in the SCIENTIFIC AMERICAN, giving a method of waterproofing cloth, on page 394, and wish to inquire whether this is one of the best methods to waterproof cloth, and whether it will prevent the grasshoppers and crickets from eating it? A. Dissolve about 8 ounces of soap in a gallon of boiling water (soft), and with this thoroughly saturate the cloth; wring out the excess of the liquid, and digest the cloth over night in a solution of 10 ounces of alum in a gallon of water; wring out, rinse in clean water, and expose to the air until thoroughly dry. Cloth thus treated is not attacked by insects or animals, resists mildew and moisture, and is sufficiently waterproof for the purpose mentioned.

(19) J. F. F. writes: I should like to experiment with the Plante secondary battery illustrated in recent issue, but before commencing should like to ask a few questions: 1. Can I not make the battery by taking two sheets of lead, six inches wide by three and one half feet long, covering with flannel and red lead same as for plates, and rolling them up together? I think of doing this because of difficulty of obtaining square glass jars here. Both sheets would have same surface as ten plates. A. Yes. 2. How many cells would be required to produce the electric light, using one of Edison's lamps? A. Probably 10 to 15. We have no experiments in this direction, and cannot say definitely. 3. About what candle power lamp would you recommend as being best for experiment or use in a room? A. 16. 4. How should the cells be connected to lamp—for quantity or tension? A. Tension. 5. Could I charge them with four to six cells Calland battery? A. Yes; one at a time, but very slowly. 6. Could they be charged all together, or should they be separate? A. See answer above. 7. How long should they be connected with battery to obtain maximum charge? A. It depends on the strength of the battery.

English Patents Issued to Americans.

From June 28 to July 1, 1881, inclusive.

Bags, coating, I. T. Tichenor, Auburn, Ala.
Cigar lighter, W. W. Batchelder, New York city.
Deadeye, W. P. Healey, Massachusetts.
Electric lighting apparatus, J. J. Wood, New York city.
Engine for compressing air, E. Hill, S. Norwalk, Conn.
Exercising machine, J. R. Judd, New York city.
Fare collector, J. J. Greenough, Syracuse, N. Y.
Fog signal, W. B. Barker, Hoboken, N. J.
Fruit storing, G. A. Cochrane, New York city.
Grain treating, T. A. Jebb *et al.*, Buffalo, N. Y.
Hair removing machine, F. Lambert *et al.*, N. Y. city.
Hat bodies, felting, G. Yule, Newark, N. Y.
Lamp, E. P. Follett *et al.*, Rochester, N. Y.
Liquid measure, G. Woolf, St. Louis, Mo.
Saw sharpener, F. Myers, New York city.
Smoke consumer, H. A. Hogel, New York city.
Spinning machinery, P. Townson, Thompsonville, Conn.
Steam, appar. for distributing, B. Holly, Lockport, N Y.
Steam, appar. for distributing, B. Holly, Lockport, N. Y.
Violin, E. Berliner, Boston, Mass.

NEW BOOKS AND PUBLICATIONS.

THE COMPLETE BREAD, CAKE, AND CRACKER BAKER. Chicago: J. Thompson Gill, Manager "Confectioner and Baker" Publishing Company.

A practical hand book for the confectioner and baker, comprising (I.) The science and art of baking; (II.) Formulæ and memoranda. The first part contains a brief statement of the scientific principles underlying the breadmaking processes, the selection and preparation of materials, the practical operations of mixing, and the construction and use of the ovens and other machinery employed by bakers. Part II. contains a great variety of practical recipes, the proportions being usually expressed in terms to permit of easy subdivision or multiplication for smaller or larger batches. Though specially designed for the professional baker the work is likely to be a useful adjunct to every kitchen.

WATER WORKS STATISTICS, 1881. London: Charles W. Hastings.

The first issue of British water works, statistics after the style of Mr. Hastings' compilations of gas works statistics. Returns are given from 134 towns, most of them giving full information touching the source of water supply, quantity, mode of distribution, cost, character of service, price per 1,000 gallons, etc., etc.

DIE DARSTELLUNG DES EISENS UND DER EISEN FABRIKATE. (Manufacture of Iron and Iron Articles.) By Edward Japing. Wien. Pest. Leipzig. A. Hartlebens. Verlag. 1881. 244 pp.

The author of this work has taken great pains to give all information possible in a thorough manner and in precise clear language. The first chapter describes the appearance, characteristics, and classification of iron ores and iron. The second chapter treats of the various methods of producing the different kinds of cast and wrought iron and steel; and the third chapter describes the methods of casting iron and steel, the furnaces used, implements, etc. The remaining seven chapters treat of the manufacture of wrought and rolled iron, sheet iron, boiler iron, wire, tubes, plating, tinning, galvanizing, enameling, cutting, punching, annealing, tempering, planing, etc. The last chapter describes the manufacture of small iron articles such as nuts, screws, chains, wire netting, cutting devices, etc. The entire field of iron industry is thoroughly explained, and the publication will be found to be a great help to the young ironworker. The work is provided with numerous illustrations.

THE WILDERNESS CURE. By Marc Cook. New York: William Wood & Co.

The curative value of out-door life in the Adirondacks in incipient consumption of the lungs was demonstrated in the writer's case twenty-five years before Mr. Cook set up "Camp Lou." Taken soon enough by one who thoroughly enjoys wood ranging, the wilderness cure is very likely to be a sure cure. But to the vast majority of consumptives the wilderness is the worst possible resort. All the advantages attending tent life in the wilderness—and they are many—can usually be secured within an hour's ride of home, often within a stone's throw, with none of the risks or discomforts entailed by banishment from home and civilization.

SCIENTIFIC INDUSTRIES EXPLAINED. By Alexander Watts. Edinburgh and London: W. & A. K. Johnston. 12mo, pp. 203. 2s. 6d.

It is hard to estimate the utility of a book like this. The descriptions given of the more important applications of science to manufactures are correct, and clear enough to such as are fairly well versed in chemistry. But they are too brief to satisfy such readers, while to the unscientific the style is too technical on the whole to be easily intelligible. Still it may prove a handy reference book to those of liberal education, so-called, whose studies have not embraced much of industrial chemistry and whose library is small.

MECHANICAL ENGINEERING. By Francis Campin, C.E. London: Crosby, Lockwood & Co. 2s. 6d.

No. 223 of Weale's Rudimentary Series; substantially an abridgment of Mr. Campin's large treatise on practical engineering, with some additions and substitutions of recent matter.

THE GAS AND WATER COMPANIES' DIRECTORY, 1881. Edited by Charles W. Hastings, London.

This, the fifth issue of the directory, shows a great improvement in form, and the editor thinks also in fullness and accuracy. It furnishes classified lists of the gas companies of England, Scotland, Wales, and Ireland, and the more important companies of Europe, Asia, and Australia, with statements of capital, officers, etc., etc. The water companies of Great Britain are similarly represented.

GAS WORKS STATISTICS, 1881. London: Charles W. Hastings.

The third annual issue of Mr. Hastings' useful compendium of British gas works statistics. Returns are given from 726 towns, showing tons of coal carbonized, make of gas, illuminating power of gas, price per thousand feet, price paid for public lamps, dividends, etc.

PAPERS READ BEFORE THE PI ETA SOCIETY, RENSSELAER POLYTECHNIC INSTITUTE, TROY, N. Y. Vol. II. No. 2. 1881.

The papers for this issue comprise: The Camber of Bridges, Thos. M. Cleemann, C.E.; the Interoceanic Canal, W. E. Danely, C.E.; Bridge Lines, their Sizes and Bearings, J. A. L. Waddel, C.E.; Rational Fractions, Adolfo E Besora, C.E.; Note on Gordon's Formula for Long Columns, W. H. Burr, C.E.; The Size of the Angle Block in a Howe Truss Bridge, by Thos. M. Cleemann, C.E.; Discussion of Paper on Braced Iron Piers, by W. H. Burr, C.E.

PAPERS OF THE ARCHÆOLOGICAL INSTITUTE OF AMERICA. American Series, II. By A. F. Bandelier. Boston: A. Williams & Co. 8vo, pp. 133.

The initial publication of the American series embraces two papers: 1. Historical introduction to studies among the sedentary Indians of New Mexico; 2. Report on the ruins of the Pueblo of Pecos. In the first paper Mr. Bandelier gives a critical review of the historical references to the seven cities, caves, or ravines, and their inhabitants; and in the second he recounts his observations among the aboriginal ruins in the valley of the Pecos. He does not attach to the Montezuma tale any historical importance whatever—not even a traditional value.

HAND BOOK OF PRACTICAL LANDSCAPE GARDENING. By F. R. Elliott. Rochester: D. M. Dewey. 8vo, cloth, pp. 96.

A second and improved edition of Mr. Elliott's practical hand book. A brief chapter on the principles of landscape gardening and the treatment of ornamental plants is followed by condensed descriptions of the principal trees and shrubs available for decorative purposes, shade, hedges, screens, etc. Then are given a dozen or more designs for lots and grounds, from a city lot in size to a 40 acre plot, each plan being drawn to scale, with specific directions for the planting of each tree and shrub. Several colored illustrations of trees and flowers serve to embellish the book, which can hardly fail to be useful to householders of moderate means who wish to make the most of their opportunities.

MODERN ARCHITECTURAL DESIGNS AND DETAILS. In ten parts. New York: William T. Comstock. $1 a part.

The tenth and concluding part of this compilation of architectural details suited to popular styles of house building of the less expensive sort, contains views, plans, and details of a handsome brick and frame cottage, the same for a dwelling in the Elizabethan style, and a number of ornamental designs for ventilating registers, chimney tops, and so on. The entire series comprises nearly 700 details, drawn to a large scale, as are all the plans and elevations. The work cannot fail to be suggestive and useful to all builders of suburban and country dwellings.

MODERN ARCHITECTURAL DESIGNS AND DETAILS. New York: William Comstock. Folio. $1.

Part 9 of this useful series includes plates 65 to 72, and contains perspective views, elevations, and plans of several artistic country houses, one with Eastlake features, each accompanied by a multitude of details.

(OFFICIAL.)

INDEX OF INVENTIONS

FOR WHICH

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

June 28, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 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. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Air brake apparatus, G. Westinghouse, Jr. 243,415
Alphabet blocks, nested, J. A. Crandall. 243,362
Aluminous cake, manufacture of C. Semper. 243,635
Amalgamator, A. V. Trust. 243,659
Animal power, N. Potter. 243,618
Atomizer for hydrocarbons, W. W. Thomas. 243,473
Auger, earth, E. A. Smith. 243,641
Automatic gate, W. H. Tupper. 243,660
Axle and box, vehicle, J. C. Jenkins. 243,571
Axle box, car, W. G. Raoul. 243,630
Axle gauge, W. W. Wills. 243,670
Axle lubricator, F. A. De Bremon. 243,523
Axles, manufacture of car, J. Smith. 243,642
Bag fastener, C. E. Brown. 243,499
Balance with tare device, spring, Fray & Pigg. 243,539
Ball trap, G. N. Sidney. 243,466
Barrel, knockdown return, Olmsted & Huffman. 243,604
Bath tub, portable, L. I. Jones. 243,573
Bearings, making chilled ball, P. W. Gates. 243,546
Bed bottom, spring, Blumenstein & Waldsmith. 243,355
Bed bottom, spring, C. A. Le Quesne. 243,584
Bed lounge, J. B. Marinee. 243,383
Bed lounge, T. Soden. 243,468
Belt clasp, W. M. Whiting. 243,480
Berth lock for sleeping cars, J. L. & C. P. Howard 243,374
Binder, temporary, J. F. Tapley. 243,411
Blasting and blasting cartridge, S. R. Divine. 243,433
Blowpipe, T. T. Morrell. 243,397
Boot and shoe crimping form, H. R. Adams. 243,422
Boot or shoe, M. Leventritt. 243,453
Boots and shoes, manufacture of, M. Leventritt. 243,452
Bottle, W. T. Goldsmith. 243,547
Bottle washer, L. Wagner. 243,662
Bottles having internal stoppers, apparatus to be used in stoppering, J. Varley. 243,414
Bracelet fastening, A. Seauret. 243,631
Brake beam, G. Westinghouse, Jr. 243,416
Brick machine, G. Carnell. 243,505
Brick mould, G. Carnell. 243,504
Broom holder, D. H. Phipps. 243,614
Brush machine, J. H. Dodds. 243,528
Buckle, A. B. Wilhelm. 243,667
Button, O. Ericsson. 243,534
Button, C. D. Hunt. 243,563
Candles, manufacturing fatty acids for making, A. M. Jacobs. 243,377
Cane, etc., process of and apparatus for extracting juice from sugar, G. A. Bazé. 243,487
Car coupling, N. Barr. 243,486
Car coupling, T. Farrell. 243,538
Car coupling, W. A. Lovelace. 243,587
Car coupling, I. S. McGiehan. 243,594
Car coupling, J. W. Page. 243,606
Car coupling, Thomas & Cowdery. 243,474
Car coupling, F. P. Wance. 243,478
Car, stock, J. C. Jones. 243,572
Car wheel, B. H. Reville. 243,623
Cars, device for unloading, G. P. Merrill. 243,388, 243,389
Cars, iron platform for railway, W. A. Cushman. 243,430
Card and box, sample, C. D. Williams. 243,668
Carding machines, mechanism for operating doffer combs of, H. & H. A. Stone. 243,650
Carpet and oil cloth fastener, J. A. Cole. 243,429
Carpet sweeper, M. R. Bissell (r). 9,783
Carriage, E. Delessert. 243,524
Carriage jump seat, G. H. Hutton. 243,565
Cartridge belt, G. Crouch. 243,363
Cash carrier, automatic, W. S. Lamson. 243,451
Catheter, E. Pfarre. 243,396
Cattle, shield for, J. Stemmons. 243,644
Chair for attaching to door steps, E. E. Porter. 243,617
Chuck for holding watch bezels, S. I. Snyder. 243,467
Churn, H. F. Batcheller. 243,350
Churn, J. A. Werner. 243,666
Churn motor, Akins & Elmore. 243,483
Coffee roaster, G. A. Beidler. 243,489
Coffer dam, J. R. Moffitt. 243,457
Collar and hame, combined horse, J. Knowles. 243,381
Collar for live stock, J. R. Speer. 243,469
Combing machine, A. Smith. 243,640
Compass, mariner's and azimuth, J. Readman. 243,460
Coop, poultry, E. Butz. 243,627
Copper ores containing precious metals, treating, P. G. L. G. Designolle. 243,675
Core boxes and flasks, jarring block for, S. J. Adams. 243,482
Corset, E. K. Bullock (r). 9,778
Corset, A. B. Curtis. 243,519
Cotton gin condenser, W. W. Thrasher. 243,413
Cotton picker, D. B. Haselton. 243,554
Cotton stalk cutter, A. B. Pearce. 243,609
Crucible and pottery mould, Driscoll & Atwood. 243,434
Cultivator, H. W. Chamberlain. 243,507
Curtain fixture, J. Shorey. 243,465
Curtain ring, T. Hipwell. 243,559
Dairy vat, Burrell & Freeman. 243,508
Dental articulator, H. L. Cruttenden. 243,517
Dish cleaner and drainer, S. B. Luckett. 243,588
Ditching machine, S. C. Robinson. 243,624
Door hanger, G. R. Kidder (r). 9,782
Door hanger, H. M. Landers. 243,582
Door spring, J. T. Rush. 243,405
Dredge, vacuum, J. F. Sanders. 243,462
Dredge winder, J. S. Stuart. 243,655
Easel, picture, A. Shedlock. 243,407
Edge setting and heel burnishing machine, W. F. Hutchinson. 243,675
Electric machines, switch for dynamo, H. J. Müller. 243,568
Elevator stop, automatic, G. F. Hammer. 243,552
Explosive compound, S. R. Divine. 243,432
Feed gearing for machine tools, Sellers & Bancroft. 243,634
Fence, portable, J. Shallenberger. 243,637
Fiber or paper pulp, reducing wood to fine, G. H. Pond. 243,616
File, corn, M. Wilson. 243,671
File, paper, J. A. Welch. 243,664
Filing machine, endless belt, D. H. Stephens. 243,645
Fire extinguisher, H. S. Parmelee (r). 9,780
Fish and game trap, Rentz & Herzog. 243,622
Fishing reel, G. Hancock. 243,371
Flue scraper, boiler, J. L. Kelley. 243,574
Fork and rake, combination, G. S. Latta. 243,583
Furnace, J. G. McAuley. 243,593
Galvanic appliance, C. J. Heylmann. 243,558
Galvanic battery, J. H. Cheever. 243,428
Game board, M. L. Henry. 243,557
Gate, J. Geib. 243,442
Gate, Myers & Frank. 243,393
Gate, W. F. Rice. 243,461
Glass globes, etc., decorative cutting of polished, J. B. King. 243,579
Glucose from grain, manufacturing, Williams & Alberger. 243,669
Glue, apparatus for the manufacture of, H. H. & W. A. Baeder. 243,485
Grain drier, steam, H. Cutler. 243,520
Graining and finishing wood, composition for, A. Wells. 243,665
Grappling bucket, F. Imhorst. 243,449
Grate, G. T. Ayer. 243,347
Gun stock, Hape & Oliver. 243,553
Gymnasiums, vaulting horse or buck for, F. Medart. 243,456
Hame fastener, E. Bouchey. 243,426
Hammer, combination, J. Straszer. 243,653
Harness, J. Truax *et al.* 243,658
Harness attachment, D. D. Baton. 243,351
Harness slide loop, J. Hudson. 243,375
Harrow, sulky, I. H. & S. Reiner. 243,621
Harvester, R. Dutton. 243,531
Harvester dropper, K. Anunsen. 243,484
Hatch door, elevator, Eames & Stever. 243,533
Hay carrier, L. Y. Myers. 243,600
Hay fork, horse, J. H. Lux. 243,382
Hay loader, Whitcomb & Wager. 243,418
Heat alarm, J. Curran. 243,518
Heat conducting vessel, H. L. Palmer. 243,459
Holdback, A. H. Thomas. 243,412
Honeycomb carrier, J. M. Davis. 243,522
Honey frame, sectional, J. Forncrook. 243,674
Hoops, vat for heating and saturating barrel, D. H. Burrell. 243,502
Horseshoeing bench, J. Sykes. 243,470
Horseshoes, machine for making, D. J. & S. Farmer 243,536
Hose clamping machine, J. F. Mallinckrodt. 243,591
Hose, machine for inserting goose necks and couplings into flexible, J. F. Mallinckrodt. 243,589
Hub band and protector, combined, C. Boseker. 243,494
Hydraulic elevator, W. H. Milliken. 243,391
Hydraulic elevator, S. E. Stokes. 243,649
Hydrocarbon burning furnace, W. W. Thomas. 243,472
Infusions, extracts, etc., preparation of vegetable, S. C. Davidson. 243,521
Injector, steam boiler, J. M. Holt. 243,560
Ink, indelible, H. Froshling. 243,441
Ink well, O. Pederson. 243,395
Iron, manufacture of, C. M. Du Puy. 243,365
Jute, preparing carbolized, N. Rosenwasser. 243,404
Kaleidoscope, V. M. Farr. 243,537
Kettle and boiler, combined process, E. H. Frazier 243,540
Lacing stud and button fastener, combined, G. W. Prentice. 243,400
Lamp support, electric, Sample & Rabl. 243,406
Lantern, hand, L. Henkle. 243,373
Lasting jack, G. W. Hutchins. 243,376
Latch, reversible, H. Pickford. 243,397
Latch, spring, E. H. Frost. 243,541
Lightning rod, J. H. Schoonmaker. 243,630
Locket, G. B. Whitney. 243,419
Loom shedding mechanism, A. Claus. 243,361
Lozenge machine, W. Sharp. 243,464
Mash, machine for stirring and discharging, S. E. Chubbuck. 243,511
Mechanical movement, L. E. Dickinson. 243,526
Metal bending machine, H. Duffey. 243,435
Middlings purifier, C. E. Sage. 243,628
Milk can, A. O. Peterson. 243,612
Milk cooling room, A. Copley. 243,514
Mineral concentrator or dry ore separator, atmospheric, A. P. Granger. 243,549
Miter box, N. J. Kinch. 243,577
Mitering machine, W. E. Eastman. 243,533
Mole trap, J. Klar. 243,580
Mordant, Turkey-red, A. M. Jacobs. 243,378
Musical instruments, mechanical, G. W. Turner. 243,661
Nailing machine, A. Newton. 243,601
Nailing machine, G. H. Perkins. 243,610, 243,611
Nut lock, J. C. Bloom. 243,493
Oil press mat, J. J. Mistrot. 243,596
Ordnance, breech-loading, T. Yates. 243,671
Ore concentrator, R. Parry. 243,607
Ore roasting furnace, J. B. Randol. 243,401 to 243,403
Oscillating chair, E. Stout. 243,651
Packing, piston, R. L. Kester. 243,379
Packing, piston, M. W. Woodruff. 243,672
Paddlewheel, W. D. Ewart. 243,535
Painting on fabrics, oil, A. Gutmann. 243,445
Paper drying machine, J. S. Piper. 243,615
Paper pulp, manufacture of articles from, G. W. Laraway. 243,677
Paper with wax, etc., machine for coating, J. T. Bedford. 243,353
Pen, stylographic fountain, C. H. Downes. 243,364
Perfume of natural flowers, and apparatus therefor, obtaining, R. A. Chesebrough. 243,510
Permutation lock, M. N. Sevier. 243,636
Photograph burnishing machine, J. P. Bass. 243,349
Photographic printing and vignetting, L. Gutekunst. 243,370
Piano action, C. Zibulski. 243,481
Picker teeth, die for trimming and cutting off, R. Aldrich. 243,423
Pipe hanger, J. F. Mallinckrodt. 243,590
Plane, bench, S. A. Piper. 243,398
Planter and dropper, corn, J. H. Dawson. 243,431
Planter, corn, W. D. Lindsley. 243,585
Planter, cotton and corn, J. G. Hanna. 243,372
Planter, seed, R. J. Gallway. 243,542
Planter, seed, C. C. Hunter. 243,564
Plow, P. Kessler. 243,576
Plow, T. E. Jefferson. 243,570
Plow, sulky, T. E. Jefferson. 243,676
Plumbers' traps, device for making, R. Cunningham (r). 9,779
Pocket, safety, A. B. Carson. 243,506
Potato digger, C. King. 243,578
Press, J. F. Gubbins. 243,369
Presses, power movement for, G. A. Porter. 243,399
Pressure brake, fluid, G. Westinghouse, Jr. 243,417
Propulsion of ships, hydraulic, S. Stucky. 243,656
Pulp engine, W. W. D. Jeffers. 243,568
Pulp, machine for moulding barrels, etc., from, G. W. Laraway. 243,678
Pump, force, M. Crossman. 243,639
Pump valve, J. H. Dunlap. 243,438
Punch, ticket, Gunther & Kowalski. 243,560
Rail fastening, I. K. Bennett. 243,490
Railway chair, W. D. Howard. 243,562
Railway signal apparatus, E. Dunlap. 243,437
Railway train indicator, T. H. Norton. 243,458
Railways, electric danger alarm for, T. A. B. Putnam. 243,619
Ratchet and clutch device, H. G. Fiske. 243,366
Rein, driving, H. G. Sieb. 243,098
Rivet, F. Ott. 243,605
Rivet, Q. E. Packard. 243,679
Rotary engine, T. A. Miller. 243,390
Rotary engine, W. H. Wigmore. 243,420
Saw mill, C. A. Hege. 243,556
Saws, machine for sharpening band, G. W. Amesbury. 243,434
Sawing machine, portable rail, J. McKinney. 243,595
Scraper, drag, Cosgrove & Welch. 243,515
Scraper, earth, J. Hale. 243,551
Screw and lever and traversing jack, combined, Stevens & Bonner. 243,646
Seal press bed plate, H. J. Stratemeyer, Jr. 243,654
Sewing machine, M. C. Gritzner. 243,444
Sewing machine table frame and treadle, J. E. Donovan. 243,529
Shank cressing, coloring, and stamping machine, Mussells & Pray. 243,599
Shearing device, W. R. Fowler. 243,367
Shoe back and counter gauge, C. W. Shippee. 243,408
Shoe nail, A. Newton. 243,602, 243,603
Shovel, spade, or scoop, C. T. Bellamy. 243,354
Siding gauge and bracket, C. Boyd. 243,357
Solar and transit instrument, J. Gardam. 243,543
Solar camera, H. A. W. Braune. 243,497
Soldering cylinder, M. J. Stark. 243,469
Soldering tweezers, L. H. Sanderson. 243,629
Spinning machine, etc., E. Denby *et al.* 243,525
Spool exhibiting case, C. E. Gould. 243,443
Spooled threads, receptacle for, N. Ware. 243,479
Squares, jointed pitch board for, F. N. Marvick. 243,592
Stamp, hand, Gates & Pettit. 243,368
Station indicator, S. B. Crane. 243,516
Steam boiler, J. F. McEntee. 243,386
Steering apparatus, steam, A. Lafargue. 243,450
Stocking, R. M. Appleton. 243,425
Stone or rock breaker, P. W. Gates. 243,545
Stove and furnace door frame, D. M. Knowles. 243,581
Stove, hot air, Goodrich & Johnson. 243,548
Stove, hydrocarbon gas, A. M. Brainard. 243,496
Stovepipe, machine for grooving loose jointed, C. F. Beaman. 243,352
Stoves, etc., draught apparatus for, F. Beaumont, Jr. 243,488
Strainer, oil tank, J. Haggerty. 243,446
Strainer, sink, J. M. Stimpson. 243,648
Straw burning furnace, J. Walrath. 243,477
Street sweeping machine, T. Bradley. 243,358
Sugar, salt, etc., holder and pulverizer for, J. McBride. 243,285
Suspender end, E. Painter. 243,394
Tag fastener, T. P. Marston. 243,384
Telegraph, L. Maiche. 243,454
Telegraph, duplex, J. M. Stearns, Jr. 243,410
Telegraph repeater, duplex, D. R. Downer. 243,530
Telegraph wires, device for deadening sound vibrations of, P. D. Connor. 243,513
Telegraphic repeater sounder, C. G. Burke. 243,359
Telephone stand, revolving, E. F. Weaver. 243,663
Telephone switch, M. G. Kellogg. 243,575
Telephone transmitter, S. Tainter. 243,657
Tire shrinking machine, A. Kiger. 243,380
Tire upsetter, B. S. Haskell. 243,555
Tire upsetter, A. A. Still. 243,647
Tool, combination, J. Strasser. 243,652
Toy bank, R. E. Turnbull. 243,475
Toy, climbing, W. C. Farnum (r). 9,781
Toy, climbing or traveling, W. C. Farnum. 243,439
Toy feudal castle, G. H. Ireland. 243,567
Toy savings bank, H. Clement. 243,512
Toy vehicle, folding, G. H. Ireland. 243,566
Trace carrier, M. K. Marvin. 243,455
Track drilling machine, Gassett & Fisher. 243,544
Traction engine driving wheel, K. Schaefer. 243,403
Transom lifter, F. V. Phillips. 243,613
Truss, I. B. Seeley. 243,632
Tubes, welding and sizing, S. P. M. Tasker. 243,471
Tubing coupling, P. Patterson. 243,608
Turn buckle, G. S. Rominger. 243,625
Type writers, wood counter for, C. T. Brown. 243,500
Undergarment, C. A. Brown. 243,498
Vapor burner, W. H. Russell. 243,626
Vapors, cooling apparatus for condensing, O. Braun. 243,496
Vehicle gear, oscillating, H. Duffey. 243,436
Vehicle spring, C. C. & J. A. Bishop. 243,492
Vehicle spring, G. Freeman. 243,440
Vehicle wheel, T. E. Jefferson. 243,569
Velocipede, A. Vreeland. 243,478
Ventilating apparatus, J. F. Hoyne. 243,448
Volute springs, machine for making, O. Bihet. 243,491
Wagon body iron, B. Burr. 243,427
Wagon, lumber, Seifer & Maschek. 243,633
Wagon top, removable, Bower & Wilkinson. 243,356
Washing machine, J. M. Champe. 243,360
Washing machine water heater, Bailey & Perrenot. 243,348
Watch crown, T. Mueller. 243,392
Water closet bowl, glass, G. E. Hatch. 243,447
Water meter, W. L. Horne. 243,561
Water trough and underground drain, J. G. Brown 243,501
Water wheel, C. Dilks. 243,527
Wells, boring, J. H. South. 243,643
Windmill, O. T. Chamberlain *et al.* 243,508
Windmill, Logan & Kelsey. 243,586
Wrench, L. Chapman. 243,509

DESIGNS.

Cards, receptacle for business, W. T. Mersereau. 12,354
Carpet, J. Pegel. 12,355
Emblematic stand or tripod for use by secret societies, L. Goddu. 12,351
Spoon or fork handle, S. W. Belk. 12,350
Toy, E. G. Williams. 12,356
Type, font of printing, C. E. Heyer. 12,352, 12,353

TRADE MARKS.

Cigars, cigarettes, and smoking tobacco, Bovee & Adams. 8,417
Cutlery of all kinds, J. Rodgers & Sons (limited). 8,419
Lard, lard oil, and neat's foot oil, N. K. Fairbank & Co. 8,420
Liquors, spirituous, Luyties Brothers. 8,418
Watch movements, Elgin Watch Company. 8,401 to 8,416

CAUTION.—*An attempt has been made to put so-called "Electro Magnetic" Brushes upon the market, but the Post-Office authorities at Washington have published the company as a fraud. We therefore caution the Public to be careful that "Dr. Scott's" name is on the box and "Electric" on the Brush. Ours is not wire, but a pure bristle Brush.*

DR. SCOTT'S ELECTRIC HAIR BRUSH.

A MARVELLOUS SUCCESS!!

NOW RECOMMENDED BY OUR BEST PHYSICIANS.)

Which has won its way to Royal favor in England, been cordially indorsed by the Prince and Princess of Wales, and written upon by the Rt. Hon. W. E. Gladstone, is now brought to the notice of the American public. It cures by natural means, will always do good, never harm, and is a remedy lasting for many years. It should be used daily in place of the ordinary Hair Brush. The Brush Handle is made of a new odorless composition resembling ebony; a combination of substances PRODUCING A PERMANENT ELECTRO-MAGNETIC CURRENT WHICH ACTS IMMEDIATELY UPON THE HAIR GLANDS AND FOLLICLES. This power can always be tested by a silver compass which accompanies each Brush.

IT IS WARRANTED TO

Cure Nervous Headache in 5 Minutes!!
Cure Bilious Headache in 5 Minutes!!
Cure Neuralgia in 5 Minutes!!
Prevent Falling Hair and Baldness!!
Cure Dandruff and Diseases of the Scalp!!
Promptly Arrests Premature Grayness!!
Makes the Hair grow Long and Glossy!!
Immediately Soothes the Weary Brain!!
Money returned if not as represented!!

It rarely fails to produce a rapid growth of hair on bald heads, where the glands and follicles are not totally destroyed.

Proprietors: The Pall Mall Electric Association of London. New York Branch: 842 Broadway.

[From Rev. Dr. Bridgeman.]

BROOKLYN.

"Gents:—I have never before given a testimonial, but am willing to encourage the use of an honest remedy. I am so pleased with your Hair Brush that I deem it my duty to write you recommending it most cordially. My hair, about a year since, commenced falling out, and I was rapidly becoming bald; but since using the Brush a thick growth of hair has made its appearance, quite equal to that which I had previous to its falling out. I have tried other remedies, but with no success. After this remarkable result I purchased one for my wife, who has been a great sufferer from headache, and she finds it a prompt and infallible remedy. A. C. Bridgeman, D.D."

[From the Mayor of Saratoga.]

"I cheerfully testify to the merits of Dr. Scott's Electric Hair Brush. It cures my headaches within a few minutes. I am so pleased with it I purchased another for my wife. It is an excellent Hair Brush, well worth the price, aside from its curative powers." JAS. B. CHAPMAN.

"I would Not take $1,000 for my Brush

If I could not replace it. Its effect is marvellous." PLINY F. SMITH, 218 Fulton Street, N. Y.

Mr. Smith is a gentleman well known in this City as a Law Publisher, and also as a Director in several Public Institutions of New York.

Head Office "Domestic" Sewing Machine Co., New York.

DR. GEO. A. SCOTT—*Dear Sir:* Permit me to add the testimony of my wife to that of the many others who have been benefited by the use of your Electric Brush. She has for years been a sufferer from Neuralgia in an acute form, but since I obtained for her one of your Brushes, she has experienced entire relief. Please accept her sincere thanks. HENRY BARTLETT.

Over 7,000 similar Testimonials can be seen at our office.

ASK FOR DR. SCOTT'S BRUSH. TAKE NO OTHER. See that name is on the box.

Mention this Paper.

A BEAUTIFUL BRUSH, LASTING FOR YEARS.

We will send it on trial, postpaid, on receipt of $3.00, which will be returned if not as represented.

Inclose 10 cents extra and we guarantee safe delivery into your hands; or will send it by express, C. O. D., at your expense, with privilege of opening and examining. But express-age adds considerably to your cost. Or request your nearest Druggist or Fancy Store to obtain one for you, and be sure Dr. Scott's name is on the Box.

MONEY RETURNED IF NOT AS REPRESENTED.

As soon as you receive the Brush, if not well satisfied with your bargain, write us, and we will return the money. What can be fairer? The Proprietors of this Publication know Dr. Scott to be respectable and trustworthy, a Brush has been placed in the hands of Mayor Cooper and Postmaster James of New York, as a guarantee of good faith.

Remittances should be made payable to GEO. A. SCOTT, 842 Broadway, New York. They can be made in Checks, Drafts, Post Office Orders, Currency, or Stamps. LIBERAL DISCOUNT TO THE TRADE. **Agents Wanted in every Town.**

Send for a Circular of our Dr. Scott's Electric Flesh Brush.

Advertisements.

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

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

GET THE BEST AND CHEAPEST.

TRADE PERIN MARK.

Silver Finish.

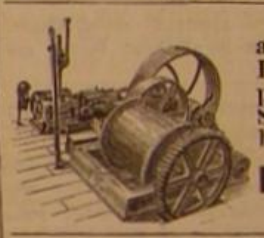
J. A. FAY & CO.

J. A. FAY & CO.,
(Cincinnati, Ohio, U. S. A.
Exclusive Agents and Importers for the United States, of the
CELEBRATED
PERIN BAND SAW BLADES,
Warranted *superior to all others in quality, finish, uniformity of temper,* and *general durability.* One *Perin Saw* outwears *three* ordinary saws.

Prevent Accidents *from slipping.* The handsomest and safest carriage step made. Forged from best iron and formed with a sunken panel, in which is secured a plating of *richly moulded Rubber.* Durability warranted. Illustrated circular free.
RUBBER STEP MANUFACTURING CO., Boston, Mass.

COE BRASS MFG. CO. TORRINGTON.—CONN.
BRASS AND COPPER IN SHEETS. MATERIALS FOR METALLIC AMMUNITION A SPECIALTY. WIRE AND BLANKS

FOR INFORMATION CONCERNING
Holly Water Works,
FOR
CITIES, VILLAGES, SUBURBAN TOWNS, FACTORIES, ETC.,
Apply to the
HOLLY MFG. CO., LOCKPORT, N.Y.
Or C. G. HILDRETH, Sec'y.
157 Broadway, New York City.



This Machine is adapted for Mining Purposes. Surpasses all others for Safety and Durability.

NOBLE & HALL,
ERIE, PA.

THE FIRE ENGINEER, THE ARCHITECT, and the Underwriter.—By Edward Atkinson. An address delivered before the Convention of the Fire Engineers of the United States, at Boston, pointing out the manifold defects in much of the architecture of the present day, from the standpoint of liability to combustion, and giving the author's views as to the proper method of constructing buildings that shall be fireproof. Treats of: Shams in Architecture. Notable examples of false methods of construction. How buildings are often set on fire by rats and spontaneous combustion. Methods of reducing fire risks. How to make a nearly fireproof building with ordinary materials. Fires caused by steam pipes. Spontaneous combustion. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 250. Price 10 cents. To be had at this office and from all newsdealers.

THE BAKER BLOWER.
[FORCED BLAST.]

The revolving parts are all accurately Balanced.
Warranted Superior to any other.
WILBRAHAM BROS,
No. 2318 Frankford Avenue
PHILADELPHIA, PA.
SEND FOR OUR CATALOGUE.

FOR SALE.
The following Wire Rope Sheave Pulleys, of Roebling's Sons' make, are for sale:
One 11 ft. Pulley, cast in halves.....$100.00
One 7 ft. " " solid..... 35.00
Two 4 ft. Pulleys, " " ..... 20.00 each.
All the Pulleys are in good order. Will deliver them at R. R. depots in Wilkesbarre, Pa., for the above price.
Address PAUL A. OLIVER, Wilkesbarre, Pa.

Leffel Water Wheels,
With recent improvements.
Prices Greatly Reduced.
8000 in successful operation.
FINE NEW PAMPHLET FOR 1879,
Sent free to those interested.
James Leffel & Co.,
Springfield, O.
110 Liberty St., N. Y. City.

THUNDERSTORMS.—BY PROF. TAIT. An interesting lecture, showing: The prominent features of a thunderstorm. Electricity in the air. Electricity from rain drops. The light of lightning. Motion and power of electricity. How electricity is distributed and how lightning rods operate, and how they should be connected with the soil. Lightning flashes several miles long. Effects of lightning. The nature of thunder. Globe lightning. Water the chief agent in thunderstorms. Theories as to the sources of electricity of thunderstorms. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 254. Price 10 cents. To be had at this office and from all newsdealers.

MODERN PALEONTOLOGY, ITS PRESENT Condition and Future Task.—By Prof. Carl Vogt. An interesting paper, in which the author passes in review the beings that lived in earlier times, and points out the proper method of studying them at the present day, and that, too, in a manner essentially different from the one usually followed, inasmuch as he tries to prove the relation between the extinct types and the modern representatives of the organic world, which he claims can be proved by generation and descent without calling in the intervention of a special power of creation existing separate from the organisms. A powerful argument in favor of the doctrine of evolution. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 249 and 250. Price 10 cents each. To be had at this office and from all newsdealers.

FIRE BRICK TILE AND CLAY RETORTS ALL SHAPES BORGNER & O'BRIEN 23 & 25 ST. ABOVE RACE, PHILADELPHIA.

THE Hancock Inspirator,
THE BEST BOILER FEEDER KNOWN.
Over 17,000 in use on Locomotive, Stationary, Marine, and Portable Boilers.
THE HANCOCK INSPIRATOR CO.,
BOSTON, MASS.

CLOUDS.—BY PROF. S. A. MAXWELL. An interesting and lucid exposition of the nature, causes, and laws which govern the formation of clouds. Nature of clouds. Their classification. Process of cloud formation and transformation. The stratus. The cumulus. The cumulo-stratus. The nimbus. The cirro-stratus. The cirro-cumulus. Cirrus. Effects of clouds. Direction and motion. Importance of the study of clouds. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 260. Price 10 cents. To be had at this office and from all newsdealers.

PORTER MANUFG. CO., Lim. New economizer. Only portable made with return flue. Absolute safety from explosion and from sparks. Send for circ. to Porter Mfg. Co., Lim., Syracuse, N.Y. G. G. Young Gen. Agt., 42 Cortlandt St., N.Y.

SCHENCK'S
WOODWORKING MACHINERY.
Planers and Matchers, Surfacers, Moulders, Tenoners, Engines, Boilers, etc., etc. BELCHER & HAGNALL, 40 Cortland St., New York.

HOUSE DRAINAGE, SEWERAGE, AND Ventilation.—A paper read by Mr. Reginald Middleton before the Society of Civil and Mechanical Engineers, London. Replete with practical information on the above subjects. A paper of value and interest to everybody. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 272. Price 10 cents. To be had at this office and from all newsdealers.

"RELIABLE"
Engines a complete success. Prices still 40 per cent. below those of other makers. Unequaled for efficiency, simplicity, and durability. Prices from $250 for 10 H. P., to $550 for 50 H. P. All complete, with Governor, Pump and Heater.
Address for circular,
HEALD & MORRIS, formerly HEALD, SISCO & Co.,
Baldwinsville, N. Y.

PATENTS SOLD Partners Secured.
Joint Stock Companies formed. Stock placed for Incorporated Companies. Good investments always on hand. Highest references given. Circulars free. E. L. RICHARDS & CO., Brokers, 733 BROADWAY, New York.

FOR SECOND-HAND ENGINES,
Address HARRIS IRON WORKS, Titusville, Pa.

VARIABLE CUT OFF ENGINE. 25 TO 50 % SAVED IN FUEL. SIMPLE IN DEVICE. ECONOMICAL DURABLE MANFD BY BALL ENGINE CO. ERIE PA.

SEND TO LONDON, BERRY & ORTON PHILA PA FOR **THE BEST BAND SAW BLADE**

THE BRUSH SYSTEM OF ELECTRIC Lighting.—An account of the workings of this interesting system, with detailed description of the Brush dynamo-electric machine and the Brush electric lamp. Illustrated with thirteen engravings. The same number contains another valuable paper on the same subject, by Charles F. Brush, M.E., descriptive of the Brush dynamo-electric machine and the lamps, showing the remarkable practical results that have been attained by their use. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 274. Price 10 cents. To be had at this office and from all newsdealers.

STOP the FLOW of FILTH FROM the HEAD. PERMANENT CURE OF **CATARRH**
HOME TREATMENT. NO CHARGE FOR CONSULTATION. The fearful effects of Catarrh on the system can be stopped. Childs Catarrh Treatment is the only known means of positive, permanent cure. Send for description, terms, etc. Address
Rev. T. P. CHILDS, Troy, O

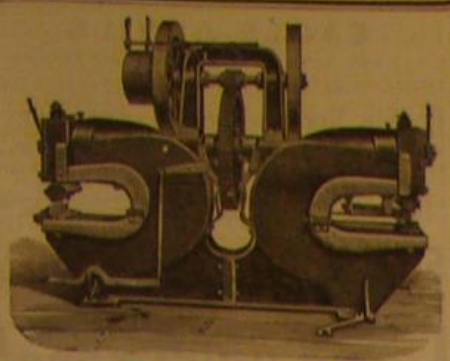
BEECHER & PECK.
Successors of MILO PECK, Manufacturers of PECK'S PATENT DROP PRESS, 11 Regular sizes. Hammers from 50 to 2,500 lb. Drop and Machine Forgings. Drop Dies.
Address Temple Place, New Haven, Conn.

SNOW'S BEST Water Wheel Governor,
MANUFACTURED BY
COHOES IRON FOUNDRY AND MACHINE CO.,
COHOES, - - N.Y.

CHEMICAL VIEW OF ENSILAGE.—AN account of the results obtained at the Vienna Experimental Station, by Moser, in a series of experiments to determine the nature and extent of the chemical changes taking place in green maize during its conversion into ensilage, and to ascertain the amount of material lost, as well as the advantages to be derived from the process in general. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 262. Price 10 cents. To be had at this office and from all newsdealers.

Round Writing
USEFUL FOR EVERYBODY
Text Book, with Instruction and Pens, $1.50.
KEUFFEL & ESSER, 127 Fulton St., New York.

BLASTING.—BY ARTHUR KIRK. A valuable paper read before the Engineers' Society of Western Pennsylvania, giving the most improved methods of drilling, the best explosives in use, and the best modes and special directions for firing. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 270. Price 10 cents. To be had at this office and from all newsdealers.



Power Punches & Shears.

We make over 100 sizes and kinds of Punches and Shears, varying in depth of throat from 3 to 36 inches, and in weight from 500 to 26,000 lb. Adapted to every variety of work.

Each side of Double Machines is worked independently of the other.

THE LONG & ALLSTATTER CO., Hamilton, Ohio.

SHAPING MACHINES,

Six in. stroke, with counter shaft and chuck, price $135. BOYNTON & PLUMMER, Worcester, Mass.

RELATIVE ILLUMINATING VALUE OF the Hydrocarbon Vapors Present in Coal Gas and their Quantitative Determination.—By G. E. Stevenson. Description of an important series of experiments by Dr. Knublach, Chemist at the Cologne Gas Works, which have had for their result the important discovery that equal volumes of the vapors of benzol, toluol, and other homologues of this series of hydrocarbons give when burned in a gas burner, in conjunction with coal gas, practically the same result in increase of illuminating power, and produce a result six times as great as that produced by the admixture of the same quantity by volume of hydrocarbon gases of the ethylene or olefiant series. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 251. Price 10 cents. To be had at this office and from all newsdealers.

SEE RACE ST. JAS. MURDOCK JR. CINCINNATI.
BRASS COPPER SILVER.
SEND WIRE, ROD, SHEET & TUBE IN THE THREE METALS FOR PRICE LIST.

$55.66 Agents' profit per week. Will prove it or forfeit $500.00. Outfit and Samples worth $5.00 free. Address E. G. RIDEOUT & CO., 10 Barclay Street, New York.

DRUNK ENNESS OPIUM Habit And the CURED
By LESLIE E. KEELEY, M.D., Surgeon, C. & A. R. R. Dwight, Ill. Books Free.

CREMATION IN ITALY.—A DESCRIPtion, by A. B. Archbald, of Florence, of the crematories recently used at Milan, and particularly those of Gorini and of Roma-Venini, both of which have been tested by the Hygienic Congress at the Cimitero Monumentale of that city, preceded by a brief sketch of previous experiments in cremation in Italy and Germany. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 262. Price 10 cents. Further information on the same subject, accompanied by engravings illustrating the German and Italian crematory furnaces, may be found in SUPPLEMENT, No. 264. Price 10 cents. To be had at this office and from all newsdealers.

TELEPHONE Latest, Best. Patented 1881. Works two miles. Circulars free. HOLCOMB & CO., Mallet Creek, O.

GOLD PENS,

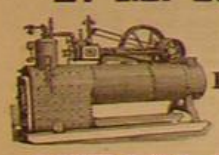
PENCILS, HOLDERS, CASES, &c.

The CALLI-GRAPHIC Pen.

A GOLD PEN and RUBBER HOLDER, containing ink for several days' writing. Can be carried in the pocket. Always ready for use. A luxury for persons who care to preserve their individuality in writing.

MABIE, TODD & BARD, 180 BROADWAY, NEW YORK.
Send for Price-List.
OUR GOODS ARE SOLD BY FIRST-CLASS DEALERS.

THE SPANISH MACKEREL AND ITS Artificial Propagation.—A paper presented to the American Association for the Advancement of Science by Charles W. Smiley. Description of the fish. Habitat and abundance. Method of capture and sale. Market prices. Its migrations. Time of Spawning. Experiments in artificial hatching. Fertilization of the eggs artificially. Experimental apparatus. Practical results. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 250. Price 10 cents. To be had at this office and from all newsdealers. The same number contains an article on "Boneless Cod: How they are Cured and Prepared for the Market."

T. M. NAGLE,

ERIE, PA.,
Manufacturer of
Portable, Stationary, AND Agricultural
STEAM ENGINES.

PATENTS.

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 *thirty-five years' experience*, and now have *unequaled 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, 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 reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infrigements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

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.

MUNN & CO., Solicitors of Patents,
37 Park Row, New York.

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

RUBBER BACK SQUARE PACKING.

BEST IN THE WORLD.
For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

B represents that part of the packing which, when in use, is in contact with the Piston Rod.
A the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.
This Packing is made in lengths of about 20 feet, and of all sizes from ¼ to 2 inches square.

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

ROOFING.

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.

BIBB'S
Celebrated Original
BALTIMORE
FIRE-PLACE HEATERS
To warm upper and lower rooms. The handsomest, most economical Coal Stoves in the world.
B. C. BIBB & SON
Foundry Office and Salesrooms, 39 and 41 Light Street, Baltimore, Md.
MANUFACTURED SLATE MANTELS.
Send for Circulars.

SULPHATE OF SODA.—BY JOHN HARgreaves. A valuable paper, giving a detailed description of the Hargreaves & Robinson direct process of manufacturing this important commercial product. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 270. Price 10 cents. To be had at this office and from all newsdealers.

$66 a week in your own town. Terms and $5 outfit free. Address H. HALLETT & Co., Portland, Me.

THE LARGEST MACHINERY DEPOT IN AMERICA.
STANDARD MACHINERY FOR ALL PURPOSES.
H. B. SMITH MACHINE CO.
ESTAB. 1849. 925 MARKET ST. PHILADELPHIA.

Pond's Tools,

Engine Lathes, Planers, Drills, &c.
DAVID W. POND, Worcester, Mass.

MACHINERY

of every description. 121 Chambers and 103 Reade Sts., New York. THE GEORGE PLACE MACHINERY AGENCY.

Luxuriant Mustache
A. L. SMITH & CO., U. S. Agts, Palatine, Ill.

ELEVATORS,

Steam and Hand Power. CLEM & MORSE, 411 & 413 Cherry St., Phila., Pa., and 108 Liberty St., New York.

SHEPARD'S CELEBRATED
$60 Screw Cutting Foot Lathe.
Foot and Power Lathes, Drill Presses Scrolls, Circular and Band Saws, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, etc. Send for catalogue of outfits for amateurs or artisans.
H. L. SHEPARD & CO., 331, 333, 335, & 337 West Front Street, Cincinnati, Ohio.

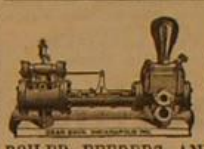
EFFERVESCENT BEVERAGES.—Recipes for making certain delicious beverages for summer use, including: Ginger Beer, Lemon Beer, Hop Beer, and Spruce Beer. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 270. Price 10 cents. To be had at this office and from all newsdealers.

CIVIL, MECHANICAL, AND MINING ENGINEERING at the Rensselaer Polytechnic Institute, Troy, N. Y. The oldest engineering school in America. Next term begins September 15. The Register for 1880-81 contains a list of the graduates for the past 54 years, with their positions; also, course of study, requirements, expenses, etc. Address DAVID M. GREENE, Director.

BEATTY'S ORGANS, 18 useful stops, 5 sets reeds, only $65. Pianos, $125 up. Illus. Catalogue FREE. Address BEATTY, Washington, N. J.

MARIE JOSEPH JACQUARD. — BY Hugh McCall. A review of the life, labors, and genius of one who handed his name down to posterity by the invention of the loom which bears his name. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 254. Price 10 cents. To be had at this office and from all newsdealers.

MONEY! MONEY!!
Fifty ways of making money sent to any address on receipt of 50 cts. C. M. KELLER, Columbus, Ind.

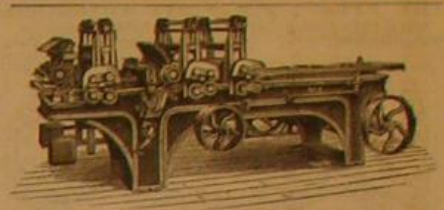

DEAN BROTHERS,
Steam Pump Works,
INDIANAPOLIS, IND.,
Manufacturers of
BOILER FEEDERS AND PUMPING MACHINERY,
FOR ALL PURPOSES.
Send for new Illustrated Catalogue.

NOW READY—The New Edition of Trautwine's Civil Engineer's Pocket Book. 12mo. 651 pages, illustrated with 680 engravings from original designs. Fifteenth thousand. Revised, corrected, and enlarged. E. CLAXTON & CO., 930 Market St., Philadelphia, Pa.

ROOTS' NEW IRON BLOWER.

POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED
IS SIMPLER, AND HAS
FEWER PARTS THAN ANY OTHER BLOWER.
P. H. & F. M. ROOTS, Manuf'rs,
CONNERSVILLE, IND.
S. S. TOWNSEND, Gen. Agt., 6 Cortlandt St., 8 Dey Street,
WM. COOKE, Selling Agt., 6 Cortlandt Street,
JAS. BEGGS & CO., Selling Agts., 8 Dey Street,
NEW YORK.
SEND FOR PRICED CATALOGUE.

PHYSICS WITHOUT APPARATUS.—An interesting series of articles showing how to perform numerous instructive experiments, in every department of physics, by means of common articles found in every household, no other apparatus being required. By following the directions here given, any person may go through an entire course of experimental physics. Illustrated with 54 engravings explanatory of the most striking experiments. Contained in SCIENTIFIC AMERICAN SUPPLEMENTS, Nos. 229, 232, 237, 243, 247, 250, 253, 262, 266, 271, and 279. Price 10 cents each. To be had at this office and from all newsdealers.


WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

40 Lovely Floral, Panel, Hand & Bouquet Chromo Cards, with name 10c. Franklin Pr'tg Co., New Haven, Ct.

ICE-HOUSE AND REFRIGERATOR.—Directions and Dimensions for construction, with one illustration of cold house for preserving fruit from season to season. The air is kept dry and pure throughout the year at a temperature of 34° to 36°. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, 116. Price 10 cents. To be had at this office and of all newsdealers.

NO MORE USE FOR OIL ON MACHINERY
Oline Lubricating Compound, manuf'd by HOLLAND & THOMPSON, Troy, N. Y. Avoids hot journals, dripping, and waste. Send for catalogue of Grease and Cups for all kinds of machinery.

COACH PAINTING.—A PRACTICAL paper, full of valuable hints on the subject of painting and decoration. How to prepare the paint foundation for the coach body. How to mix and apply the colors. Floated or false tints. Method of painting the running parts. The decorative art. Harmony of colors. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 262. Price 10 cents. To be had at this office and from all newsdealers.

"The 1876 Injector."

Simple, Durable, and Reliable. Requires no special valves. Send for illustrated circular.
WM. SELLERS & CO., Phila.

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

$72 A WEEK. $12 a day at home easily made. Costly outfit free. Address TRUE & Co., Augusta, Me.

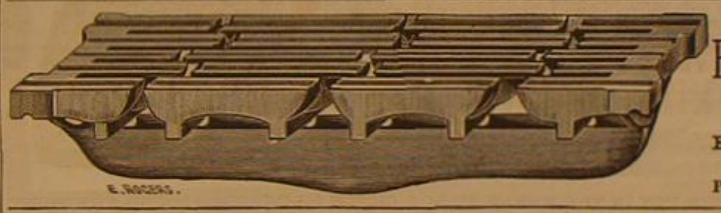
GREAT IMPROVEMENTS

RECENTLY MADE IN
CRUSHING AND GRINDING

GOLD AND SILVER ORES, BONES, PHOSPHATE ROCK, & CHEMICALS.
We compel Quartz to grind Quartz.
Address for new circular
BAUGH & SONS, Philadelphia.

TRANSMISSION OF POWER TO A DIS-

tance.—By Arthur Achard. A paper read before the Institution of Mechanical Engineers. Being a summary of the practical results obtained in the transmission of power to a distance by different modes. I. Transmission of Power by Wire Ropes, and the formulæ for calculation. II. Transmission by Compressed Air, with formulæ. III. Transmission by Pressure Water, with formulæ. IV. Transmission by Electricity. General results obtained by the several methods. This is one of the most valuable, practical, and comprehensive papers on the subject recently published. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 274 and 275. Price 10 cents each. To be had at this office and from all newsdealers.


W. C. WREN'S
Pat. Grate Bar,
Manufactured by
D. S. CRESWELL,
Eagle Iron Foundry,
816 RACE ST.,
PHILADELPHIA, PA.

RUPTURE

cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.

SKELETON LEAVES AND CRYSTALlized Grasses.—Full directions for easily and quickly making these pleasing preparations for household adornment. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 270. Price 10 cents. To be had at this office and from all newsdealers.

CARY & MOEN
STEEL WIRE OF EVERY DESCRIPTION & STEEL SPRINGS.
234 W. 29. ST. NEW YORK CITY

A SOBER, COMPETENT, AND EXPERIenced Engineer wants a situation to run a Stationary or Locomotive Engine. References furnished. Address I. A. R., East Stroudsburg, Monroe Co., Pa.

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

HOOVER
DO YOUR OWN PRINTING
Presses and outfits from $3 to $500. Over 2,000 styles of type. Catalogue and reduced price list free.
H. HOOVER, Phila., Pa.

UNITED STATES OCEAN COMMERCE in United States Built Ships. An able paper, by W. H. Webb, Esq. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 272. Price 10 cents. To be had at this office and from all newsdealers.

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

FOUND

THE STEAM PUMPS MADE BY
VALLEY MACHINE CO.,
EASTHAMPTON, MASS.,
Are the best in the world for Boiler Feeding and other purposes.

GAS MOTORS. — DESCRIPTION, ACcompanied by eight figures, showing details of working parts of a system of small gas motors as made by Buss, Sombart & Co. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 265. Price 10 cents. To be had at this office and from all newsdealers.

MACHINISTS' TOOLS.

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

SALICYLIC ACID.—A VERY COMPREhensive article on this very important antiseptic agent. General properties of salicylic acid. Its uses in medicine and surgery, and in veterinary practice. Industrial properties in connection with the preservation of meat, milk, butter, beer, wine, jams, jellies, fruits, eggs, glue, ink, etc., and in tanning processes, and sugar factories. Household purposes. For disinfecting, etc. The descriptions and directions here given will enable any one interested in the matter to find out the best means of deriving profit from the wonderful properties of this extremely useful substance. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 226. Price 10 cents. To be had at this office and from all newsdealers.

BARNES' PATENT FOOT POWER MACHINERY.
Complete outfits for actual Workshop business. Lathes, Saws, Formers, Mortisers, Tenoners, etc. Machines on Trial if desired. Mention this paper and send for Descriptive Catalogue and Price List.
W. F. & JOHN BARNES, Rockford, Ill.

CONSOLIDATION LOCOMOTIVE FOR the Philadelphia and Reading Railroad. Dimensions and perspective and back-end views of one of the heavy freight engines recently built for the Reading Railroad by the Baldwin Locomotive Works; with account of trial trips and details of performances. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 252. Price 10 cents. To be had at this office and from all newsdealers. The same number contains an interesting article on "Fast Passenger Locomotives."

COILED WIRE BELT & SASH CORD
CLEAR'S
TO THE P.T.P. CO. 328 7TH AVE. N.Y.

Shafts, Pulleys, Hangers, Etc.
Full assortment in store for immediate delivery.
WM. SELLERS & CO.,
79 Liberty Street, New York.

Agents Wanted. Sells rapidly. Particulars *free*. CROSS 4S 50 CENTS. S. M. SPENCER, 112 Wash'n St., Boston, Mass.

WOODWORKING MACHINERY,

For Railroad Shops, Planing Mills, Car Builders, Cabinet, Carriage, Sash, Door, and Blind Makers.
S. A. WOODS MACHINE CO., 172 High St., Boston; 91 Liberty St., N. Y.; 61 S. Canal St., Chicago.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)
Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

THE
New York Ice Machine Company,
115 Broadway, New York, Room 78.
LOW PRESSURE BINARY ABSORPTION SYSTEM.
Machines Making
ICE AND COLD AIR.
Low Pressure when running. No pressure at rest. Machines guaranteed by C. H. Delamater & Co.

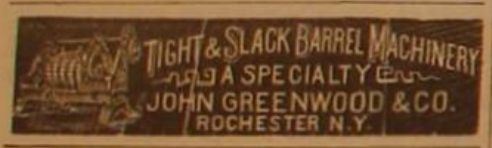
BOILER COVERINGS,

ASBESTOS-LINED, REMOVABLE.
THE PATENT AIR SPACE COVERINGS.
THE CHALMERS-SPENCE CO., Sole Proprietors,
10 Cortland St. Foot of East 9th St., New York.

Mill Stones and Corn Mills.
We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys, and Gearing specially adapted to Flour Mills. Send for catalogue.
J. T. NOYE & SONS, Buffalo, N. Y.

BOILER FEEDER.
(A Pump and Heater Combined.)
Guaranteed to make more steam with less fuel than any other way of feeding boilers. Send for circular. Agents wanted.
D. E. RICE,
191 Atwater Street, Detroit, Mich.

FOR SALE.—Steam Mill in North part of State. New first-class engine and machinery. Beside railroad. Good location for chair, broom, and fork handle, or other wood manufacture. A bargain for cash.
WM. IRWIN, 132 Broadway, New York.



CRATEFUL—COMFORTING.
EPPS'S COCOA
BREAKFAST.
"By a thorough knowledge of the natural laws which govern the operations of digestion and nutrition, and by a careful application of the fine properties of well-selected Cocoa, Mr. Epps has provided our breakfast tables with a delicately flavored beverage which may save us many heavy doctors' bills. It is by the judicious use of such articles of diet that a constitution may be gradually built up until strong enough to resist every tendency to disease. Hundreds of subtle maladies are floating around us ready to attack wherever there is a weak point. We may escape many a fatal shaft by keeping ourselves well fortified with pure blood and a properly nourished frame."—*Civil Service Gazette.*
Made simply with boiling water or milk. Sold in tins only (¼ lb., and lb.), labeled
JAMES EPPS & CO.,
HOMŒOPATHIC CHEMISTS,
London, England.
New York and Chicago Depots, SMITH & VANDERBECK.

PLANING AND MATCHING MACHINE.

C. B. ROGERS & CO., Norwich, Conn., and 109 Liberty St., N.Y.
Special Machines for Car Work, and the latest improved Wood Working Machinery of all kinds.

H.W.JOHNS'
ASBESTOS
LIQUID PAINTS,
ROOFING,
Steam Pipe and Boiler Coverings,
LINING FELT,
STEAM PACKING,
WICK PACKING,
FLAT PACKING,
PURE ASBESTOS MILL BOARD,
GASKETS,
Asbestos Sheathings, Coatings,
Cements, &c.
Descriptive price lists and samples sent free.
H. W. JOHNS M'F'C CO.,
87 Maiden Lane, New York.

THE CAMERON STEAM PUMP,
DESIGNED FOR USE IN
GOLD, SILVER, COAL, AND IRON
MINES,
ALSO FOR GENERAL MANUFACTURING AND
FIRE PUMPS.
Pumps furnished with Movable Linings in Iron, Composition, or Phosphor-Bronze.
Address THE A. S. CAMERON STEAM PUMP WORKS,
FOOT EAST 23d STREET, NEW YORK CITY.

SHAFTS PULLEYS HANGERS
At Low Prices. Large Assorted Stock.
A. & F. BROWN, 57-61 Lewis St., New York.

ERICSSON'S
New Caloric Pumping Engine
FOR
DWELLINGS AND COUNTRY SEATS.
Simplest cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.
DELAMATER IRON WORKS
C. H. DELAMATER & CO., Proprietors,
No. 10 Cortlandt Street, New York, N. Y.

ICE AT $1.00 PER TON.
PICTET ARTIFICIAL ICE CO., Limited,
P. O. Box 388. 142 Greenwich St., New York.
Guaranteed to be the most *efficient* and *economical of* all existing Ice and Cold Air Machines.

THE NONE-SUCH TURBINE.
The Latest and Best.
THE TWIN ROTARY PUMP.
The Best Fire Pump Made.
CIRCULAR SAW MILLS.
With Ball's Patent Lever Set.
MILL GEARING & SHAFTING.
Twenty years' experience. We guarantee satisfaction. Tell us your wants, and we will give the information.
CLARK & HEALD MACHINE CO.,
Turners Falls, Mass.

Steel Castings
From ¼ to 15,000 lb. weight, true to pattern, of unequaled strength, toughness, and durability. 15,000 Crank Shafts and 10,000 Gear Wheels of this steel now running prove its superiority over other Steel Castings. Send for circular and price list.
CHESTER STEEL CASTINGS CO.,
407 Library St., Philadelphia, Pa.

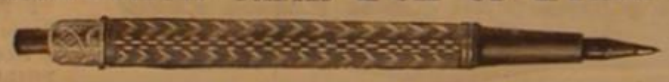
Jenkins' Patent Packing and Valves.
"THE STANDARD."
Jenkins' Packing has *never failed* to make a perfect joint where directions were followed. Jenkins' Valves are warranted steam tight and are made of the best steam metal. JENKINS BROS., 71 John St., New York.

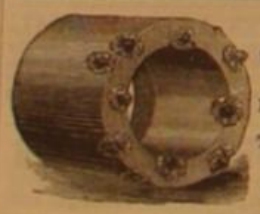
Columbia Bicycle.
A permanent, practical road vehicle, whose graceful model and elegant appearance excite universal admiration. It is carefully finished, and confidently guaranteed as the best value for the money to be attained in a bicycle. Send 3c. stamp for 24 page catalogue with price lists and full information.
THE POPE MFG. CO.,
597 Washington St.,
BOSTON, MASS.

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

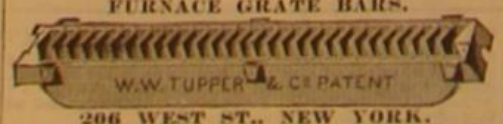
BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay, Guanos, Oil Cake, Feed, Corn, Corn and Cob, Tobacco, Snuff, Sugar, Salts, Roots, Spices, Coffee, Cocoanut, Flaxseed, Asbestos, Mica etc., and whatever cannot be ground by other mills. Also for Paints,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

PATENT COLD ROLLED SHAFTING.
The fact that this shafting has 75 per cent. greater strength, a finer finish, and is truer to gauge, than any other in use renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS' PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLINS,
Try Street, 2d and 3d Avenues, Pittsburg, Pa.
Corner Lake and Canal Sts., Chicago, Ill.
☞ Stocks of this shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass.
Geo. Place Machinery Agency, 121 Chambers St., N. Y.

HOLDS INK FOR A WEEK'S USE. ANY GOOD INK MAY BE USED.
The Mackinnon IRIDIUM POINTED Pen or Fluid Pencil.

THE ONLY RESERVOIR PEN IN THE WORLD WITH A CIRCLE OF IRIDIUM AROUND THE POINT.
Always ready. Always with you. Cannot Blot. Cannot be worn out in a lifetime.
MacKINNON PEN CO., 192 BROADWAY, CORNER JOHN STREET, NEW YORK.
General Supply Depots in all principal cities in America and Europe.

Diamonds & Carbon

For all kinds of Mechanical Purposes.
Carbon for Mining Drills
A SPECIALTY.
Best quality at the lowest price.
The Oldest Established House in the U. S.
J. DICKINSON,
64 Nassau Street,
NEW YORK.

FRIEDMANN'S PATENT
EJECTORS
Are the cheapest and most effective machines in the market for
Elevating Water and Conveying Liquids
from Mines, Quarries, Ponds, Rivers, Wells, Wheel Pits; for use in R. R. Water Stations, Factories, etc. They are splendidly adapted for conveying liquids in Breweries, Distilleries, Sugar Refineries, Paper Mills, Tanneries, Chemical Works, etc. Send for illus. catalogue to
NATHAN & DREYFUS,
Sole Manufacturers, NEW YORK.

FURNACE GRATE BARS.


206 WEST ST., NEW YORK.
The best and cheapest. *Send for Circular.*

Jarvis Furnace Co.
Patent Setting for Steam Boilers, Burns' Screenings and Slack Coal without Blast. No. 7 Oliver St., Boston; No. 92 Liberty St., New York; No. 709 Market St., St. Louis; No. 1 Second St., Baltimore.

OPEN BACK PRESSES.
STILES & PARKER PRESS CO., Middletown, Ct.

HOUGHTON'S
Boiler and Tube Compound
(Purely Vegetable)
Loosens Scale from the Boiler and Tubes and prevents further formation. Send for circular.
HOUGHTON & CO.,
15 Hudson and 130 Reade Sts., New York.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

BRADLEY'S CUSHIONED HAMMER
BRADLEY & COMPANY SYRACUSE, N.Y.

TELESCOPES *Microscopes, Opera Glasses, Spectacles, Barometers, Thermometers and Compasses,* R. & J. BECK, Manufacturing Opticians, Philadelphia, Pa. Send for **Illustrated Priced Catalogue.**

Gear Cutting. Send for list of Gears.
GRANT, 4 Aiden St., Boston, Mass.

NEW YORK BELTING AND PACKING COMPANY, THE
"ONLY THE BEST"
Is our motto in Emery Wheels. All regular sizes and numbers, and special shapes to order.
37 & 38 PARK ROW, NEW YORK.

WATCHMAN'S IMproved Time Detector, with Safety Lock Attachment, Patented 1875-6-7. Beware of Infringements. This Instrument is supplied with 12 keys for 12 different stations. Invaluable for all concerns employing night watchmen. Send for circulars to E. IMHAUSER, P. O. Box 2875. 212 Broadway, New York.

THE STEARNS MANUFACTURING CO.,
ERIE, PENNSYLVANIA, make a specialty of improved
SAW MILL MACHINERY.
Designed in its construction for producing lumber economically and rapidly. Plans and estimates for Mills of any capacity furnished on request. Also build
ENGINES, BOILERS, AND MACHINERY IN GENERAL.

Estab'd **EAGLE ANVILS.** 1843.
Solid CAST STEEL Face and Horn. Are Fully Warranted. Retail Price, 10 cts. per lb.

Double Screw, Parallel, Leg Vises.
Made and WARRANTED stronger than any other Vise by FISHER & NORRIS only, Trenton, N. J.

"1880" Lace Cutter. By mail, 50c. Discount to the trade. Sterling Elliott, 302 Dover St., Boston, Mass.

50 BEAUTIFUL ALL NEW DESIGNS of Butterfly, Dragon-fly, Robin Redbreast, Pinks, Pansies, Violets, and Moss Rosebud Chromo Cards, name on, 10c. Card Mills, Northford, Ct.

TO INVENTORS
THE
Howard Manufacturing Co.
(INCORPORATED,)
364 & 366 Broadway, New York.
Organized for the manufacture and introduction of
PATENTED NOVELTIES
AND
YANKEE NOTIONS,
OF EVERY DESCRIPTION.
AMPLE CAPITAL.
Latest Improved Machinery.
CONNECTIONS WITH ALL WHOLESALE MERCHANTS IN THE UNITED STATES AND CANADA.
Agents in Foreign Countries.
Correspondence without charge, with all who desire their inventions *in our line* developed.

PROSPECTUS
OF THE
Scientific American
FOR 1881.
The Most Popular Scientific Paper in the World.

VOLUME XLV. NEW SERIES.
COMMENCES JULY 1.

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.

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

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

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

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, 1 year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for 1 year. This includes postage, which we pay. Remit by postal order or draft to order of Munn & Co., 37 Park Row, New York.

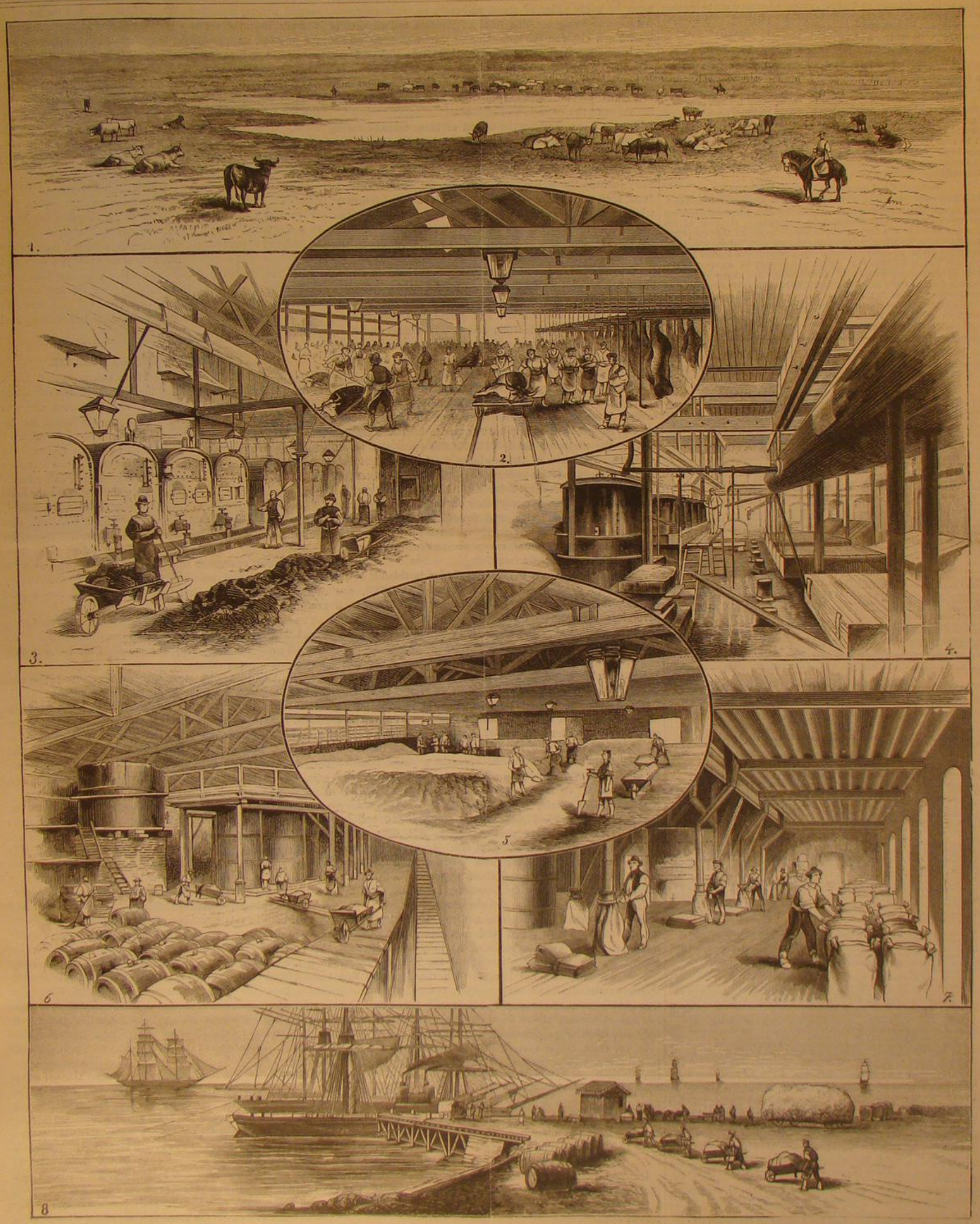
PRINTING INKS.
THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts. Philadelphia, and 59 Gold St., New York.

SCIENTIFIC AMERICAN

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

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

Vol. XLV.—No. 6. [NEW SERIES.] NEW YORK, AUGUST 6, 1881. [$3.20 per Annum. [POSTAGE PREPAID.]



1.—Pasture and Watering Places for Cattle. 2.—Slaughter House. 3.—Boiler House. 4.—Condensers. 5.—Hall for Salting the Tasajo. 6.—Tallow Trying. 7.—Fertilizer Packing. 8.—Dock.

LIEBIG'S EXTRACT OF MEAT.—MANUFACTORY AT FRAY BENTOS (SOUTH AMERICA).—(See page 84.)

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.

Remit by postal order. Address

MUNN & CO., 37 Park Row, New York

The Scientific American Supplement

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

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

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

Scientific American Export Edition.

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

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

NEW YORK, SATURDAY, AUGUST 6, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

Acid, sulphuric, dangers of..... 90
Annunciator, speaking tube*..... 82
Antimony, American..... 81
Aquarium cement (10)..... 91
Beans..... 87
Bell telephone, antecedents of*.. 83
Blast furnaces..... 88
Boiler, steam, notes..... 85
Car starter, improved*..... 86
Chilcat meteor, the..... 89
Cold air machine, Presidential.... 84
Comet, another, discovered..... 81
Conductor's printing office, a..... 82
Diatoms..... 89
Drop press, new*..... 86
Drying cylinder, steam, explosion* 88
Electrical exhibition, Paris..... 81
Electricity, fired by..... 81
Engineering inventions..... 84
Etching steel (7)..... 91
Extract of meat, Liebig's*.....79, 84
Flowers, preservation of..... 87
Fouling in iron ships..... 90
Gelatine emulsion, making..... 89
Ground glass, imitation..... 89
Hay rick, sheltering*..... 87
Headache, nervous..... 82
Industries of New York..... 80
Ink for rubber stamps (5)..... 91
Inventions, engineering..... 84
Inventions, mechanical..... 88
Inventions, miscellaneous..... 85
Inventions, recent..... 90
Ivory, to remove stains from (4).. 91
Leech farm, a..... 90
Liebig's extract of meat*. 79, 84
Lightning, protection from..... 88
Meat, Liebig's extract of*.....79, 84
Mechanical inventions..... 88
Mechanics, educated..... 82
Meteor, Chilcat, the..... 89
Microphone, phosphorus, a..... 90
Moles, how they aid agriculture*. 82
Monolith, large, a..... 88
Mother-of-pearl..... 81
Oils to extract from herbs (8).... 91
Paste, strong (9)..... 91
Patents in Turkey and Liberia.... 81
Pearl inlaying..... 81
Pharaoh's serpent and sea snake 87
Pistols, toy, and lockjaw..... 80
Portraits, composite..... 90
Printing office, a conductor's..... 82
Pulley, safety, new*..... 82
Railway travel, risks of..... 80
Sea lamprey, the*..... 87
Ships, iron, fouling in..... 90
Silicon in steel rails..... 90
Speaking tube annunciator*..... 82
Steam boiler notes*..... 85
Sulphuric acid, dangers of..... 90
Telegraph, first in this country (6) 91
Telegraph line, underground..... 81
Telephone, Bell, antecedents of*. 83
Toy pistols and lockjaw..... 80
Wagons, steam..... 86
Water, hot, for the heart..... 88
Waterproofing..... 81

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 292,

For the Week ending August 6, 1881.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—French Candle Moulding Machines. 2 plates, 29 figures.—Morane's candle-moulding machines..... 4648
The Canal System of New York. (Continued from No. 291.)—Water supply.—Depth and remedies.—Steam propulsion.—Canal business.—Comparative table.—Proposed improvements..... 4651
On Harvesting Machinery. By E. SAMUELSON. (Continued from No. 291.)—Wire binding mechanism.—String binding mechanism..... 4653
The Mersey Railway Tunnel. 8 figures.—Section of tunnel.—Driftway and shafts.—Passenger ferry now in use.—Ferry for vehicles.—Map showing position of tunnel.—Working at the face of the heading.—View of Birkenhead Works, etc.—Working at bottom of shaft.—Going down in the bucket..... 4653
The Electrical Railway of Gross-Lichterfield, near Berlin. 2 figures.—Stationary Steam engine coupled with the Siemens dynamo-electric machine.—Car of the electrical railway..... 4655
Links in the History of the Locomotive. 1 figure.—Murdock's locomotive, 1784..... 4655
Turquois of New Mexico. By B. SILLIMAN. 1 figure..... 4656

II. TECHNOLOGY AND CHEMISTRY.—Textile Fibers under the Microscope. 9 figures.—Views showing the distinctive characteristics of the leading textile fabrics..... 4647
Straw and Straw Goods in Tuscany..... 4649
New Discovery Regarding Gelatine Emulsions. By L. WARNERKE..... 4650
A Drying Cupboard. 1 figure..... 4651
Pellet's Burette. 1 figure..... 4651
Muscular Activity and Decomposition of Matter. Dr. O. KELLNER 4657
Wickersheim's Process for the Preservation of Organic Substances. By H. STRUVE and O. JACOBSEN..... 4657
What is Glucose?..... 4657
Preliminary Notice of a New Vegetable Coloring Matter. By SAM. P. SADTLER and WM. L. ROWLAND..... 4658
Cause of Reddening of Carbolic Acid..... 4658
Apparatus for Continuous Displacement. 1 figure..... 4658
Densities of Liquefied Oxygen, Hydrogen, and Nitrogen. By L. CAILLETET and P. HAUTEFEUILLE..... 4658
Japanese Still. 2 figures..... 4659
Distillation of Essential Oils. 2 figures. Heywood and Baron's Still..... 4659
The Impurities in Water and their Influence upon its Domestic Utility. By G. S. JOHNSON..... 4659
Automatic Washing of Precipitates. 2 figures..... 4660
Haemocyanine and its Distribution in the Animal Kingdom. By C. F. W. KRUKENBERG..... 4660
On the Conduct of Finely-divided Iron toward Nitrogen. By IRA REMSEN..... 4661
Spontaneous Ignition of Coal. By H. HÆDICKE..... 4661
Ozone..... 4661
Synthesis of Salicylic Acid. By E. F. SMITH..... 4661
On Pure Coke. By W. W. STAVELEY..... 4661
Sodium and Potassium Chlorides in Mineral Analyses. By Dr. FR. MUCK..... 4661

III. PHYSICS AND PHYSICAL APPARATUS.—Tubular Dispensing Balance. 1 figure. Gorham's Dispensing Balance..... 4656
A New Lactometer. 1 figure. Soxhlet's Lactometer..... 4656
A New Ureometer. Renson's Ureometer..... 4657
Experimental Determination of the Velocity of White and Colored Light. By Dr. J. YOUNG and Prof. G. FORBES..... 4657
Photophonic Selenium Receivers. How made..... 4662

IV. NATURAL HISTORY, ETC.—Ophiophagy. Eating of a full-grown Water Moccasin (Ancistrodon piscivorus) by the King Snake (Ophibolus sayi)..... 4661
Street Trees and Public Grounds. The best trees for street shading, and how they should be planted..... 4662

THE INDUSTRIES OF NEW YORK.

That New York is an important manufacturing center, as well as the commercial metropolis of the country, is generally little thought of, yet it is this "productive industry" which has principally caused its astonishing growth in population, and by which the most of those who live here find their support. Its vast commerce requires many workers, and supports a large class who do little or no work, simply living on the interest of former accumulations; but the productive industry here, aside from the mere handling of the products of the industry of others, distributes, through the countless channels which reach the family and the individual, the means of living, which have caused our thoroughfares to be so crowded, and which have necessitated so many miles of street railways, elevated railroads, ferries, and bridges. The total of imports and exports of New York city for the last calendar year was $896,189,814—a little more than half of that of the whole United States—but the productions of the workshops and factories of the city, whereby the raw or half finished materials were brought into shape for practical use, amount to more than one-half the value of the exports and imports.

The statistics showing the extent of these manufacturing industries have recently been forwarded to the Census Bureau at Washington, by Charles E. Hill, who has been the chief special agent here supervising their collection. They include the business of the year from June, 1879, to June, 1880, and do not cover a few special lines of industry, which have only been made subjects of investigation by general agents for the whole United States. For 189 different branches of business, as specified, the capital employed was $157,581,749, in 11,068 establishments, employing 262,459 hands, using 1,312 boilers, and 1,124 engines of 41,951 horse power, and producing goods valued at $435,422,102. Of these hands 133,998 were males above 16, 63,482 females above 15, and 1,393 children and youth, and this enumeration of help does not include proprietors or firm members, superintendents, bookkeepers, or salesmen—none, in short, connected with the mercantile department, but only those working for wages as producers. It will be at once observed that, adding these exceptions, we would greatly swell the number of those who find employment in the several branches of business, although the latter would largely be paid according to the profits of the business. Taking the materials used—$267,043,236—plus the wages paid, from the value of the products, we have $78,864,832, for the payment of these others engaged and the interest on capital. The figures given for capital are, probably, more imperfect than those for any other particular, for in many cases they represent an original investment, largely grown in value, and many of the industries have grown up literally almost without capital, except such as furnished by the brain and muscle of their founders.

Among the important items not included in this list is the manufacture of silk goods (which was $7,842,515), gas ($5,199,979), shipbuilding, and brewing and distilling, with several minor industries, for which the statistics have not yet been completed. The whole, it is estimated, will bring the total very nearly up to $500,000,000.

The most important industry in the list is the manufacture of men's clothing, a branch of business which has grown wonderfully since the introduction of power for cutting as well as sewing. The production in this line is valued at $59,798,697, employing 64,056 hands, while women's clothing figures for $18,599,487, employing 17,267 hands. In boots and shoes, 123 factories make goods to the value of $4,799,371, and 716 custom shoemaking shops produce $2,863,620 worth. The products of slaughtering and meat packing were valued at $29,297,527, including 244,275 beeves, 122,500 calves, and 662,600 sheep. In machinery the product was $5,077,046; and in engines and boilers, $3,213,371; car building and repairing, $547,037; metal goods and metal spinning, $445,473; steam fitting and steam heating, $1,289,259; iron casting and finishing, $5,489,251; tin, copper, and sheet iron ware, $2,347,182; furniture, $9,605,779; wood brackets, moulding, turning, etc., $1,371,083; and drugs and chemicals, $3,138,178.

But any notice of the business and manufacturing industry of New York city would be incomplete without taking into account the circumstances of its location, whereby a population of some 800,000, just across the East and North Rivers, whose shores are fringed with the factories and warehouses of city firms, all contribute to swell the production of this common center. The industries thus carried on are not at all considered in these statistics, which cover only the establishments within the city lines; when, however, the work of the Census Bureau shall be so far completed that it will be possible to collate the figures touching the productive industry of these intimately related sections, the grand total will show an aggregate of exchangeable commodities which will, in money value, bear no mean proportion to the total exports and imports of the port of New York.

TOY PISTOLS AND LOCKJAW.

On summing up the casualties of our explosive holiday, the Fourth of July, the numbers of the killed and maimed rival those of some battles which have decided the fate of empires.

The majority of the injuries were inflicted by the toy pistol, using blank cartridges, the introduction of which has been followed by a general epidemic of lockjaw, particularly in our larger towns and cities.

The toy is a cheap contrivance of cast iron, with a barrel about two inches long. It is a breech loader, intended for blank cartridges, the powder being held in a metallic case either by a paper wad or by folding inward the slashed end of the cartridge case. There is no half-cock; the trigger catch is roughly made, and there is always danger of an accidental discharge when the hinged barrel is being returned to place after the insertion of the cartridge. At such times the barrel is held in the left hand, and the discharge inflicts an ugly wound in the palm. Other wounds are inflicted by the paper wad, or by fragments of the cut end of the copper cartridge-case, which are shot off with considerable force. In other cases buck-shot, gravel, nails, or other missiles, placed in the barrel by heedless or malicious urchins, have caused severe, sometimes fatal, injuries. The more serious wounds, however, are usually caused by accidental discharges, the powder, wad, or copper fragments entering the lacerated palm, and so injuring the nerves that lockjaw is the result. There were seventeen fatal cases of this sort in Baltimore on the Fourth. Fifty cases were brought in for treatment in three hospitals in this city, with eight or ten deaths; and there is no telling how many cases were under private treatment. Other towns appear to have suffered proportionally except Philadelphia, where, in consequence of fifteen fatalities from toy-pistol wounds last year, the use of the weapon this year was suppressed by the city authorities.

Other towns will do well to follow the example of Philadelphia. Parents are often ignorant or careless, and a five or ten cent pistol offers irresistible attractions to many boys. In anticipation of next year's celebration some means should be adopted to prevent the manufacture, sale, and use of such murderous playthings. Even the use of the pistol-shaped device for snapping paper caps should be stopped. No harm can result from them directly; but the habit which children acquire of pointing such things at each other in fun, is not conducive to care or caution in handling real pistols.

RELATIVE RISKS OF RAILWAY TRAVEL.

A few weeks ago, when a traveler was murdered on a railway train near London and thrown out of the car while the train was passing through a tunnel, a great ado was made, especially in American papers, with regard to the insecurity of travelers in the English cars. The plan of confining two or three or at most half a dozen travelers in a small cab, out of reach and hearing of their fellow travelers on the train, and unprotected by conductors or other trainmen, was unsparingly criticised and ridiculed. For the sake of a degree of (undesirable) privacy any traveler, it was said, was liable to find himself cooped up with a murderer like Muller or Lefroy; or, in case of a lady, with a brute like Valentine Baker. The opportunity thus afforded for robbery, murder, or outrage was declared to be impossible with American cars, and remarks derogatory to the common sense of Englishmen were freely indulged in because they would not give up their system for ours.

The recent robbery of a train of cars on a Missouri road by a bold and well-organized gang of desperadoes gives the English press an opportunity to retaliate in kind. A prominent London paper says:

"The American cars seem specially made to invite this kind of outrage. With the English system such a wholesale raid is impossible. In any case one carriage alone could be robbed here before the passengers and officials could organize resistance. As there is no example of such an event in our railway history, we may assume that the difficulties and dangers are so great as to deter even the most daring criminals. The actual danger of murder or robbery is far less on English lines than on American."

In this view of the case our English friends are as much at fault as the American critics of the English system were. The conditions under which the two systems are operated make a fair comparison of the relative security to life and property afforded by them quite impossible, while the rarity of violent crimes under both systems shows that the risk to the traveler in either is amazingly small. Indeed, considering the large numbers of persons always in transit by rail, both in this country and England, the rare occurrence of crimes on the road must be accepted as proof either that traveling is exceptionally conducive to morality or else that, whether car compartments are large or small, railway travel affords fewer facilities for the commission of serious crimes than the ordinary conditions of social life. The murder of people in church during divine service is a more frequent occurrence, if criminal statistics are worth anything, than like crimes on railway trains; but that affords no basis for a comparison of car seats and church pews as aids to crime.

It is pretty certain that under ordinary conditions of travel no ill-disposed person would choose a public car on an American railway for individual murder or robbery with any reasonable hope of escape, as Lefroy and Muller did in England. It may be equally true that an organized raid upon a train of cars on an English road would be prevented or made unsuccessful by the plan of the cars and the distribution of the passengers. But such a deterrent effect would be much less certain were the train to be run over a long and sparsely settled route, such as was taken advantage of by the Missouri train robbers. Such crimes are no more attempted in the neighborhood of our larger centers of railway communication then they are on roads leading from London or Liverpool, and it would seem that the surroundings of the roads and the more frequent stations are more influential in pre-

venting train robberies in the East as in England, than anything in the construction of the cars or the make up of the train. Given equal time for the work, we are inclined to think that fewer men would be required to capture and go through a train of English cars than one of American cars, while the robbers' chance of meeting serious resistance on the latter would be much the greater. But this question of comparative immunity from attack plays a very insignificant part in determining the choice of large or small compartments, compared with popular customs, popular habits of thought with respect to privacy or promiscuity, the varying hazard of undesirable social contacts while traveling, and all that sort of thing. The English have their prejudices as Americans have theirs, and matters of this sort are more apt to be decided by prejudice than by the calculation of infinitesimal risks to life or property.

PATENTS IN TURKEY AND LIBERIA.

General patent laws have been lately passed and promulgated in Turkey and Liberia, in which countries American citizens may now, for the first time, secure their new inventions.

The Turkish patent law is substantially a copy of the French and German systems. Any person may take a patent on deposit of drawings and specifications. Longest term of the patent fifteen years, annual tax $18. The invention must be worked within two years from the date of the patent. The penalties for infringement and the proceedings are the same as in European countries.

In Liberia the patentee must be the inventor, or must have lawfully acquired the invention from the inventor. Drawings and specifications must be furnished. The government fee is fifty dollars. The proceedings are much the same as in taking an American patent. The invention must be worked within three years after the grant of the patent. Those desiring to obtain patents in either of the above countries may obtain further information at this office.

WATERPROOFING.

Without considering the processes by which cloth is waterproofed with such substances as India-rubber, oils, wax, and varnishes, there are several processes in practical use by which cloth is rendered non-absorbent of water—and for all practical purposes waterproof—without materially affecting its color or appearance, greatly increasing its weight, or rendering it entirely airproof. These processes depend mainly upon the reaction between two or more substances, in consequence of which a substance insoluble in water is deposited in the fibers of the cloth.

The following are several of these processes:

LOWRY'S PROCESS.

Soap	2 ounces.
Glue	4 "
Water	1 gallon.

Soften the glue in cold water and dissolve it together with the soap in the water by aid of heat and agitation.

The cloth is filled with this solution by boiling it in the liquid for several hours, the time required depending upon the kind of fiber and thickness of the cloth. When properly saturated the excess of liquid is wrung out and the cloth exposed to the air until nearly dry; then digested for from five to twelve hours in the following solution:

Alum	13 ounces.
Salt	15 "
Water	1 gallon.

It is finally wrung out, rinsed in clean water, and dried at a temperature of about 80° Fah.

Paut's process requires a small quantity of oil, but in other respects resembles the last. It is given as follows:

Sodium carbonate (com'l)	1 pound.
Caustic lime	½ "
Water	2½ pints.

Boil together, let it stand to settle, then draw off the clear lye, and add to it—

Tallow	1 pound,
Resin	½ "

previously melted together. Boil and stir occasionally for half an hour, then introduce—

Glue (previously softened)	3 ounces,
Linseed oil	3 "

and continue the boiling and stirring for another half hour.

In waterproofing one-half ounce of this soap is mixed with a gallon of hot water, and in this the goods are soaked for about twenty-four hours, according to thickness and character. The pieces are then allowed to drain until partly dried, then soaked for six hours or more in a solution prepared as follows:

Aluminum sulphate	1 pound.
Lead acetate	½ "
Water	8 gallons.

Shake together, allow to settle, and draw off the clear liquid.

Wring out after rinsing, and dry at a temperature of 80° Fah.

Bienvaux uses, instead of glue and oil as above, the gelatinous portion of sea-wrack grass with a small quantity of a drying oil and common resin-soda soap.

In Reimann's process the cloth is passed slowly by machinery through a tank divided into three compartments, the first containing a warm solution of alum, the second a warm solution of lead acetate, and the third pure water, which is constantly renewed. The cloth on passing from the latter is brushed and beaten to remove the salt adhering to the surface, and finally hot pressed and brushed. In this case lead sulphate is deposited in the fibers.

In Townsend's process two solutions are used as follows:

British gum	20 pounds.
Soap, white	10 "
Water	16 gallons.

The solution is boiled for some minutes, and if color is required one pint of logwood liquor is added. The second solution consists of a saturated solution of alum in water, or—

Zinc sulphate	6 pounds.
Water	9 gallons.

Bullard's process is somewhat similar to Riemann's. In this strong aqueous solutions of sulphate of aluminum and lead acetate are used alternately.

Berlin waterproof cloth is said to be prepared by saturating the cloth in a solution of acetate of aluminum and copper, then dipping it successively in water glass and resin soap.

MOTHER-OF-PEARL AND PEARL INLAYING.

Mother-of-pearl is chiefly obtained from the pearl oyster (*Meleagrina margaritifera*) which is found in the Gulf of California, at Panama, Cubagua, Ceylon, Madagascar, Swan River, Manila, and the Society Islands. The black-lipped shells from Manila are most highly prized. The Society Islands furnish the silver-lipped sort, and Panama the "bullock" shells.

The genera *Haliotus*, turbo, etc., also furnish some mother-of-pearl. Technically the mother-of pearl obtained from the pearl oyster is known as white pearl; that of *Haliotus* or sea-ear as aurora or ear-shell; it is easily distinguished from the former by its prismatic colors and wrinkled appearance.

The peculiar and varied tints exhibited by mother-of-pearl is due to the structure of its surface, which, owing to the great multitude of minute grooves upon it—often many thousands to the inch—decompose the light which falls upon it and reflect different hues.

The pearl shell is lamellar in structure, and admits of being split into laminæ, but this method of dividing it is seldom resorted to owing to the liability of spoiling the shell.

In working up mother-of pearl the saw, file, and grindstone are the principal tools employed. A shell is selected with a coating of the substance of a thickness as nearly as possible to suit the required purpose. Square or angular pieces are cut out with a small circular or buck or fret saw to suit convenience, the piece being held and manipulated with the hand or clamped in a vise. Buttons and such circular pieces are cut with an annular or crown saw fixed upon a mandrel. All such tools used in cutting pearl must be kept well moistened with water to prevent over-heating. The pieces are usually dressed upon a grindstone, the edge and face of which are grooved or ridged to prevent clogging. The stone is kept wet when in use; for this purpose weak soapsuds is better than water alone.

When the pieces have been properly shaped on the stone they are dressed with pumice stone and water. In some cases the better plan is to have the piece of pumice stone shaped so as to adapt it to the form required and held in a vise while the work, held in a clamp, is revolved in contact with it on the lathe. After the application of the stone fine powdered pumice stone, free from coarse grit, is applied with a cork or cloth moistened with water. In the final polishing rotten-stone is employed. This is moistened with dilute sulphuric acid (1 acid, 15 water) and applied with a cork. The acid is said to develop finely the striated structure of the shell. In some works it is thought necessary to use emery before the rotten-stone and to use a limpid oil in place of the acid.

Knife and razor handles of pearl, after having been roughed out, are drilled where the rivets are to be inserted, lightly riveted together, shaped on the stone, and finished as above described, the last finishing touch often being done by friction of the hand of the workman.

In some shops much of the polishing is done on cloth-covered wheels, the moist cloth carrying the polishing materials. Separate wheels are used for the different materials. For some common work powdered chalk or Spanish whiting is used in place of rotten-stone.

Pearl is etched by a process very similar to that used in etching copper. The designs or patterns are drawn upon it with asphaltum varnish, and all parts not intended to be etched having been similarly protected, the piece is submitted to the action of nitric acid. When the parts unprotected have been sufficiently eaten away by the acid the piece is rinsed in cold water and the varnish washed off with a little turpentine or benzine.

Thin pieces of mother of pearl of a like pattern are usually gang-cut; that is, the thin plates are glued together, then held in a clamp and cut, drilled, and dressed as one piece, after which they are separated by being thrown into hot water, which separates the glue.

In common pearl-inlaid work, films or very thin pieces of mother of-pearl are connected to a background, usually of *papier mâché* or iron, by japan varnish. The plate having been cleaned and dried receives a coat of the varnish, and when this is nearly dry the pieces of pearl, cut out with a scissors by the artist to represent leaves or designs, are pressed against and adhere to the varnish. The plate is then put in the japanner's oven until the coating becomes hard. A second coating of varnish is then put on—indiscriminately over the pearl and all—and when this has been dried or hardened in the oven the portions adhering to the pearl pieces is removed with a knife blade, and the whole surface is rubbed smooth with pumice stone and water. With the aid of a little gold size, gold leaf, and color, and camel's-hair brush the artist then develops the design, the beauty of which depends of course upon his skill. Finally the article receives a coat of clear spirit varnish.

Besides the white and aurora shell referred to above, the glistening green snail shell is very frequently used. Its tints are light and dark green, yellow, and pink, blended. The varnished surface is sometimes ornamented with transferred drawings or engravings. When the varnish is nearly dry the engraving is spread out face downward upon it and carefully pressed so as to exclude air bubbles. After the varnish is thoroughly dry the paper is well moistened with warm water by means of a sponge. It may then be rubbed off, the lines of the print remaining adhering to the varnish.

THE PARIS ELECTRICAL EXHIBITION.

Among the promised novelties connected with the exhibition will be a boat propelled by electricity. For this purpose there will be a water basin fifty feet in diameter, in which the boat will be kept moving. In the center of the basin, on a pedestal, will be a brilliant electric light. At various points within the palace models of statues will be placed as supports for electric lights. Each exhibitor of lights is also to have a saloon set apart for the special show of his system.

The passenger station of theelectric railway will be within the exhibition building, and the track will run on the ground—not elevated as at first intended.

During the exhibition there will be a congress of electricians, of which sixty-five French members have been appointed by the President of the Republic. The congress will publish an official report, and only members will be allowed to be present.

Another Comet Discovered.

Mr. J. M. Schaeberle, of Ann Arbor, Mich., discovered, July 13, a new comet, the third of 1881. In the telescope it showed a bright center and a clear though faint tail. It appeared in the northeast, in the constellation Auriga, not far from the point of appearance of the comet now passing out of sight. The new comet is rapidly increasing in brightness, and will continue to do so until about the 21st of August, when it promises to be quite conspicuous, certainly as a telescopic object. It will be nearest the earth about August 20, a day or two after its perihelion passage, when it will be about 40,000,000 miles away. So far "the orbit presents no special resemblance to that of any known comet," the Harvard astronomers say, though Professor Stone, of Cincinnati, thinks he finds in it a close resemblance to that of the great comet of 1337. It seems to be moving in a northerly direction.

American Antimony.

A Baltimore dispatch informs us that a carload of antimony, ten tons in all, was on the 14th of July received by C. L. Oudesluys & Co., from the southern part of Utah Territory being the first antimony received in the East from the mines of that section. The antimony was mined about 140 miles from Salt Lake City. The ore is a sulphide, bluish gray in color, and yields from 60 to 65 per cent of antimony. All antimony heretofore came from Great Britain and the island of Borneo, and paid an import duty of 10 per cent ad valorem, and there is also some from Sonora. It is believed that with proper rail facilities to the mines of the West there will be no need of importations.

Underground Telegraph Line in New York.

The United States Underground Telegraph Company has laid an experimental series of seventy-two wires, extending from the headquarters of the Fire Department, in Mercer street, to Police Headquarters in Mulberry street. The wires are laid in long wooden boxes covered with a preparation of silica and other substances designed to exclude dampness and secure perfect insulation. It is said that if the present experiment is successful the system will be extended so as to include the police stations, engine-houses, and fire-alarm boxes.

Fired by Electricity.

An interesting illustration of the danger attending the manufacture of some kinds of rubber goods was shown in the origin of the recent fire which occurred in the Ætna Rubber Mills, at Jamaica Plains. The cement which fastens the seams of rubber coats is largely made of naphtha. The mere act of lifting a piece of rubber cloth from a pile of half-a-dozen similar ones, cut for garments, developed so much electricity that a spark was observed to escape. It came in contact with the naphtha cement, or with gases arising from it, and instantly the whole room was in a blaze. Fortunately the fire was extinguished without destroying the mill, the loss being only about a thousand dollars.

It is not known that anything can be done to prevent the occurrence of another accident of precisely the same kind, whenever all the atmospheric conditions are favorable. One would suppose, however, that a certain degree of dampness would remove all danger from that source.—*Commercial Bulletin.*

M. BOUCHUT'S experiments with pepsine for destroying worms in the stomach and bowels have been continued with extremely promising results. Even the tape-worm succumbs to the digestive action of pepsine in large doses, while the more highly organized tissues of the stomach are unaffected.

Educated Mechanics.

We have received the twelfth annual and thirteenth statistical report of the Cincinnati Board of Trade and Transportation for 1881, which is a nicely printed pamphlet of two hundred pages.

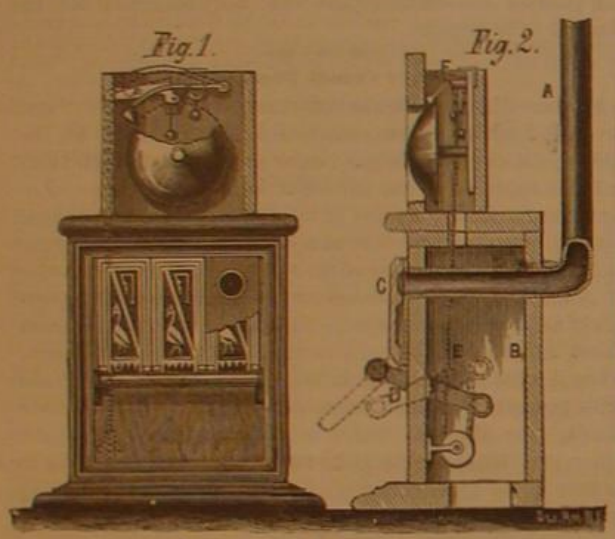
From Article II. of its constitution it appears that the object of this association is to collect and record such local and general statistical information relating to manufactures and commerce as may promote the manufacturing, commercial, and financial welfare of their city, and especially to protect, foster, and develop its manufacturing and other industrial interests.

After commenting on the success, financially and otherwise, of the Eighth Cincinnati Industrial Exposition, the directors, in their report, hint at the establishment of a school of technology, which their position as a manufacturing community makes peculiarly important. They say:

"We need educated mechanics; and no mechanic is a master of his business without the technical training such schools alone can give. The Exposition Buildings furnish ample room and accommodations for such an enterprise, the Mechanics' Institute School is a good nucleus to start on, the Department of Arts and Sciences of the same institution is a step in advance to the end desired, and this year the exposition should be made the means of enlisting a public co-operation which would provide for Cincinnati just such a school as is needed."

SPEAKING TUBE ANNUNCIATOR.

The engraving shows a novel speaking tube annunciator, in elevation and in section. The tube, A, enters the box,



SPEAKING TUBE ANNUNCIATOR.

B, and terminates behind the hinged drop, C. There may be several tubes and as many drops. Below the drop or series of drops there is a rocker, D, whose arms extend into the box, and are connected by a cord, E, with the trigger of the bell at the top of the box.

When a person in a distant portion of a building wishes to communicate with another who is within hearing distance of the bell he blows in the speaking tube, and the air current thus created being directed against the drop, C, at the other end of such tube, causes it to fall upon the outer bar of the rocker, D. The drop being constructed of a thick metal plate, and therefore heavy, tilts the rocker, as shown in dotted lines, so that it pulls on the cord, E, which, in turn, tilts the lever that raises the hammer, which is instantly released and allowed to fall upon the bell, which gives the required notice. The person thus called will, after responding to the message, close or replace the weighted drop in its upright position, and thus relieve the rocker, which, being released, returns automatically to its former position, and is ready for the next alarm.

This invention was recently patented by Mr. W. R. Ostrander, of New York city.

MOLES—HOW THEY AID AGRICULTURE—HOW THEY CAN BECOME A NUISANCE—HOW THEY MAY BE DESTROYED.

The common ground mole or "meadow mole," as this little animal is often called, is of interest from a zoological point of view, but in this article it is proposed to deal only with the practical side of the subject in its relations to agriculture and horticulture.

The mole is both useful and hurtful. When his services more than counterbalance the injury he commits he should be left unmolested. On the other hand, when he becomes, as he often does, an intolerable nuisance, he may be more or less successfully dealt with in the manner we will proceed to describe.

It is very annoying to see a handsome lawn covered with unsightly ridges plowed by the noses and paws of these little depredators; but the knowledge that they are the natural enemies of the numerous worms and grubs that sometimes make fearful war upon the tender roots of growing young crops, renders it often difficult to decide whether the moles are to be welcomed as allies or combated with such means as are available.

The mole is a purely carnivorous animal, and never does any damage to plant life except in pursuit of his prey. He may break and disturb the tender roots of young plants, but he does not devour them, and he is often wrongly blamed for injury which has been committed by the insect depredators he has caught and devoured.

The field mouse, on the contrary, does devour tender succulent roots, and the mole is too often charged with the damage thus sustained by farmers, in addition to that really due to his burrowings.

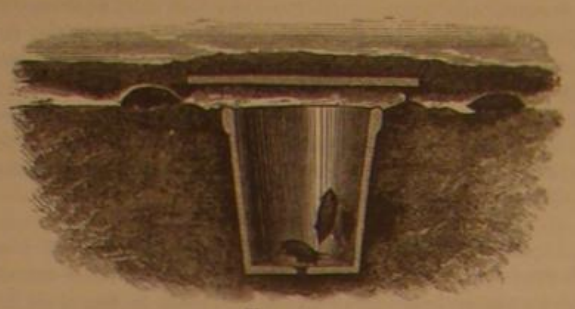


FIG. 1.

Experiments performed in France to determine the usefulness of moles as insecticides show that the number of grubs, etc., destroyed by them is enormous. A single mole, in one instance, devoured 432 maggots and 250 grubs in four days. Another ate 872 maggots and 540 grubs in twelve days.

Prof. Weber, a distinguished naturalist of Zurich, Switzerland, performed some interesting experiments with moles to prove their carnivorous character and their destructiveness to larvæ. In the stomachs of fifteen moles captured in different localities, not the slightest trace of vegetable matter could be found. He shut up two moles in a box in which fresh grass was growing, and also inclosed in the same box a case of grubs and earthworms. The moles devoured 341 white worms or grubs, 193 earth worms, 25 caterpillars, and a mouse—bones, skin, and all—in nine days. He next gave them raw meat cut in small pieces, and mixed with chopped vegetables. The moles ate the meat but did not touch the vegetables; and when vegetables alone were given them the animals soon died of starvation. It has been computed that a single mole may destroy 20,000 grubs in a single year.

In the face of these experiments it is positively asserted by some that moles will eat wheat grains with avidity, and that poisoned wheat introduced into their burrows through holes punched with a stick is sure death to them. We have tried the latter without impairing the health of the moles, and we have more faith in mole traps, in the use of which we have had considerable experience and with varying results.

We give herewith engravings illustrating two implements of destruction, both quite simple, either of which will be found practically useful.

The simplest form of trap, and one that will prove effectual if skillfully employed, is the jar mole trap shown in Fig. 1. A glass or stoneware jar is sunk into the ground under the runs, as indicated in the engraving. The moles, while running along, fall into the jar, and the vertical slip-

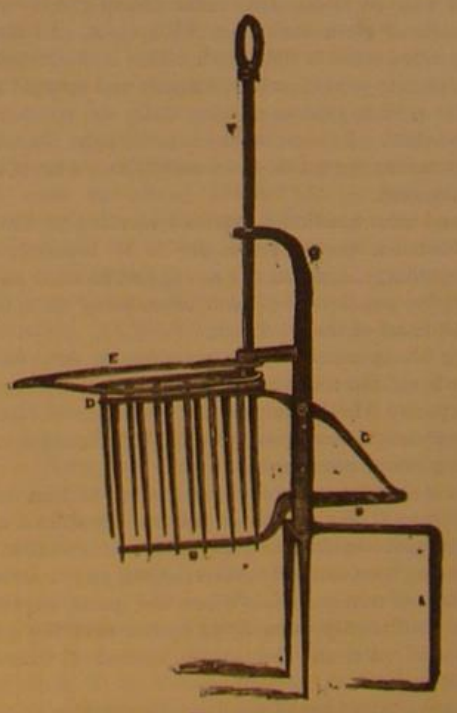


FIG. 2.

pery sides of the jar prevent their getting out again. Field mice are also frequently caught in these traps, which leads to the suspicion that they are the authors of much of the mischief attributed to moles, whose burrows form convenient avenues for the intruders.

Another effective mole trap was described and illustrated in the *Rural New Yorker* some time ago, and not unlike one illustrated in these columns a few numbers back. It is shown in Fig. 2 and is thus described by our contemporary:

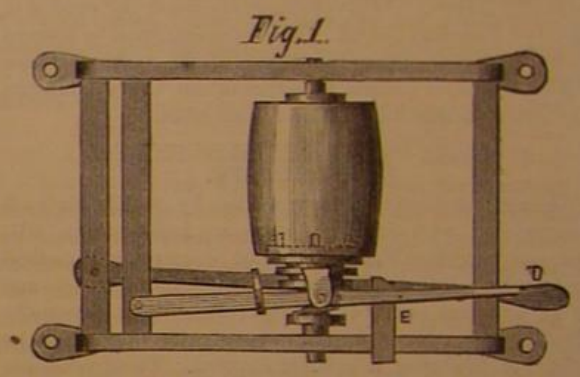
The spikes, A, three-quarters of an inch wide and tapering somewhat at the end, are pressed into the ground beside the mole track as far as possible, so that the trigger, B, which is not yet attached to the lever, C, rests upon the surface of the mole track, the prong head, D, meantime being held in its present position by the ring at the top of the upright square bar, F. Now let it slip from the hand. The force of the spring, E, will drive the prongs, D, into the ground, perhaps half way. Press them entirely down with the foot, and raise and lower them several times so as to give firmness to the earth and a free passage to the prongs. Then raise up the prong head to its present position, and place the lever, C, in one of the notches of the trigger, B, according as the other end of the latter is more or less depressed. Now the mole cannot again pass through this track without so pressing upon the earth as to move the trigger, at B, which releases the lever, C, and permits the spring, E, to act, sending the prong head into its place with great force, securely pinning (generally killing) the mole.

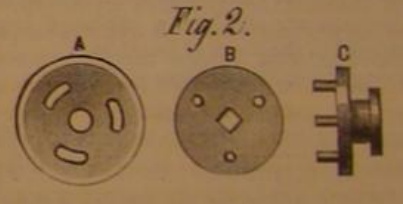
There are a number of other traps more or less effective, but the two represented in our illustrations exhibit the two diverse ways for catching moles, other appliances in use being simply modifications of the plans represented.

NEW SAFETY PULLEY.

The engraving represents an improved safety pulley applicable to cotton gins and other machinery, when it is desirable to be able to quickly arrest the motion of the machinery in case of accident. The device is very simple and not liable to accidental derangement. Fig. 1 in the engraving is a plan view of the device, and Fig. 2 shows the principal parts.

The pulley is loose on the shaft, and has attached to one end a slotted plate, A, near which the collar, B, is secured on the shaft. A collar, C, carries three pins, which fit corre-





McCORD'S SAFETY PULLEY.

sponding holes in the collar, B, and engage the slotted collar, A, attached to the end of the pulley. The pins projecting from collar, C, are kept into engagement with the collar, A, by a spiral spring surrounding the shaft and pressing against the collar, C. The latter is provided with a grooved boss, which receives a forked arm attached to the lever, E, and the lever, E, is connected with a foot lever, D, so that when either lever is moved the pulley will be instantly disengaged from all connection with the shaft by the withdrawal of the pins from the slotted plate in the end of the pulley.

This device may be made double so that it may be made to shift from one pulley to another, and so reverse the machinery with which it is connected. It may be applied in this way to hoisting machines.

Further information in regard to this invention may be obtained by addressing Messrs. C. C. P. McCord and C. D. Churchell, of Hazel Grove, Independence County, Ark.

A Conductor's Printing Office.

It appears that German railway conductors are made happy by the addition to their equipment of a paper mill and printing office, the invention of a Berlin engineer, to be hung around the neck, which, according to an exchange, is to completely manufacture passenger tickets before the eyes of the wondering public. The apparatus is said to be somewhat complicated in construction, but its manipulation is as simple as its working is correct, for, should the operator not proceed in the way required by the mechanism, it will not print all the figures and words wanted, but the word "Falsch" (wrong) in the place where the fault was committed. At the same time this portable printer checks the number of tickets issued, so that any given moment the money in the hands of the conductor can be compared with the value of the tickets printed and taken.

Nervous Headache.

Dr. Œhlschläger, of Danzig, says, in *Allgemeine Medicinische Central Zeitung*, that he has found salicylate of sodium to be a remedy of great value in the treatment of nervous headache, especially if given in a dose of one gramme (gr. xv.) in the beginning of an attack. It usually produces drowsiness, and after a few hours the patient wakes up refreshed and free from pain. It, however, often fails to produce this effect in cases dependent on anæmia.

THE ANTECEDENTS OF THE BELL TELEPHONE.

BY GEO. M. HOPKINS.

Should the recent decision of the U. S. Circuit Court, at Boston, in reference to the Bell telephone patent, be sustained by the higher court, it will prove calamitous not only to inventors who have succeeded Bell in telephonic inventions, but to the public at large, who will be at the mercy of a powerful monopoly, so far as telephonic communication is concerned. Already the workings of this power are beginning to manifest themselves in increased and apparently exorbitant rents, with no corresponding increase in the efficiency of the instrument or in the perfection of the service.

This being the condition of things, it behooves telephone inventors and telephone users to inquire as to the scope of Bell's patent, and to acquire a knowledge of the status of the art of telephony prior to the invention of Bell.

Should it be found that articulate speech had been transmitted from one point to another by means of electricity before Bell thought of the telephone, or should it be proved that instruments as old as the telegraph, without any alterations or additions whatever, could be made to transmit and receive articulate speech through the agency of electricity, then it might be very properly questioned whether the broad claim for the "new art of transmitting speech by electricity" could be sustained, even though Bell's results were secured by improved devices.

In regard to the early transmission of speech, it is certain that Reis, in 1861, transmitted vocal sounds by means of electricity, and it is authoritatively stated that he transmitted words.* It is certain that Reis's instrument *can* be used to transmit articulate speech; but now this instrument is claimed to be crude and imperfect. The ordinary Western Union telegraph key and sounder, as elements of a telephonic system, are even more crude and imperfect, and yet with a common telegraph key, used as a transmitter, I have transmitted articulate speech, which has been received by means of a common telegraph sounder, and this without modifying either key or sounder in the least. It is simply a matter of adjustment. Now, could a broad claim for talking to a telegraph key and listening to a telegraph sounder be sustained? Can a broad claim for a "*new* art of transmitting speech by electricity," by old and well known instrumentalities, be sustained, when the new results are secured by mechanical skill, exercised in adjustment merely?

Clearly, if Reis transmitted vocal sounds, or signals, or words, and if Bell has done the same thing through the agency of the same force, but in a more perfect manner, it should signify nothing, since degrees of perfection are not patentable. As a writer of this journal very aptly said a short time since: "If Reis's instrument was crude and imperfect, the same may be said of Bell's, for when it is constructed and operated according to his patent, and used independently of subsequent inventions, it proves inadequate for commercial purposes under the usual conditions of use." The original principle of the Bell telephone has really been replaced by Reis's invention, as will presently appear. That is, the Bell telephone has reached its present usefulness and popularity through the adoption of the Blake or some other form of transmitter substantially like the original Reis transmitter.

It is claimed by the advocates of the Bell system of telephony that the lack of efficiency in the Reis transmitter was due to the fact that intermittent currents of electricity were employed instead of an "undulatory" current, which Bell holds as essential; but it can be proved that in all contact telephone instruments the current is intermittent, and this is especially noticeable in the class having small contact surfaces like the Blake and Reis instruments.

* *Boettger's Notizblatt*, No. 15; *Dingler's Polytechnic Journal*, vol. 169, p. 369, 1863.

If the language of the learned judge who rendered the decision above referred to is applicable to Bell's invention, it should also apply to that of Morse or Reis. The judge says: "There is some evidence that Bell's experiments with the instrument described in Fig. 7, before he took out his patent, were not entirely successful; *but this is now immaterial; for it is proved that the instrument will do the work, whether the inventor knew it or not, and in the mode pointed out by the specification.*"

It is equally just to say that the telegraph key and sounder are operative for the transmission of speech, "and that it is immaterial whether Morse and other telegraph inventors knew it or not, "*for it is proved that the instrument will do the work*," and as the invention of the telegraph now belongs to the public, every function of the telegraph instrument belongs to the public also.

It is even more just to say the same of Reis's invention. It makes no difference whether Reis knew it or not (but he did know it), the transmission of articulate speech by means of his instrument is an undeniable fact.

From the foregoing it will be seen that it is at least questionable whether *any one* is now entitled to a broad claim for transmitting speech by electricity.

Many of the claims of Bell as to the particular method and means employed by him for the transmission of telegraphic and other signals are manifestly too broad and cover some of the oldest inventions in telegraphy.

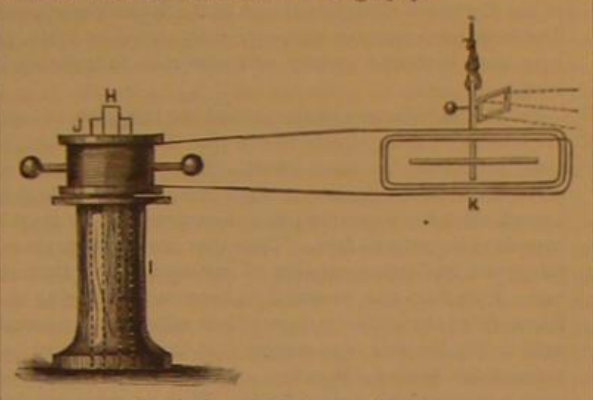


Fig. 2.—Oersted's Induction Apparatus.

For example, the first and second claims in his patent of March 7, 1876, read thus:

"1. A system of telegraphy in which the receiver is set in vibration by the employment of undulatory currents of electricity.

"2. The combination of a permanent magnet or other body capable of inductive action with a closed circuit," etc.

These claims are anticipated by the invention of Oersted in 1820 (Fig. 2). His apparatus consisted of a compound bar-magnet, H, mounted in a standard, I, and surrounded near its upper end with a coil, J. This coil was in a closed circuit with a distant coil, K, containing a vibratory magnetic needle. By moving the coil, J, up and down on the magnet, H, "undulatory" currents were produced, which vibrated the needle, giving intelligible telegraphic signals.

The more recent magneto-induction key of Siemens and Halske (Fig. 3) operates in substantially the same way.

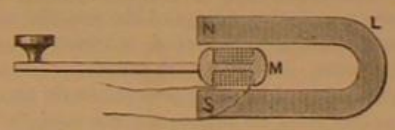


Fig. 3.—Siemens and Halske's Magneto-Induction Key.

Between the poles of the magnet, L, is placed a Siemens armature, M, which, being vibrated by means of the lever, produces "undulatory" currents in the circuit in which it is included. This system antedates Bell's.

The first Bell telephone is shown in Fig. 4. The armature *c* is fastened loosely by one extremity to the uncovered leg of the electro-magnet *b*, and its other extremity is attached

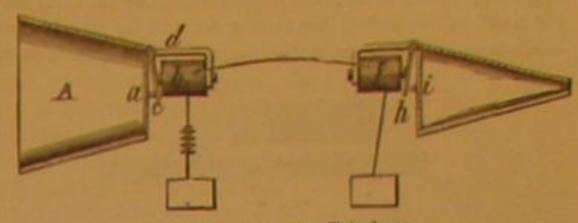


Fig. 4.—Bell's First Telephone.

to the center of a stretched membrane *a*. When a sound is uttered in the larger cone *A* the membrane attached to it is set in vibration, and the armature connected with the membrane is forced to partake of the motion, and thus electrical undulations are created upon the circuit which influences the electro-magnet *f* at the opposite end of the line, so that the motions of the armature *h* and membrane *i* are the same as in the same members of the transmitting instrument.

Fig. 5 represents the later Bell telephone. The form is

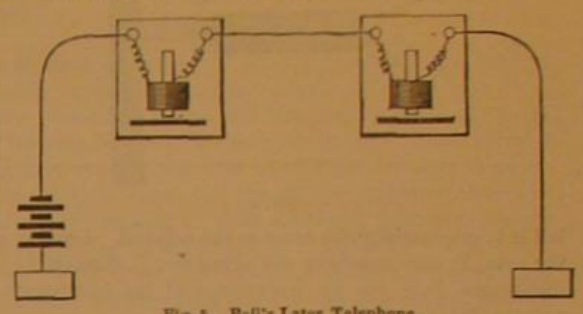


Fig. 5.—Bell's Later Telephone.

simplified, but the principle upon which it operates is the same as that of the first instrument.

It will be observed that the transmitter and receiver are alike, that the instruments are upon a continuously closed circuit, and it seems to be questionable whether Bell's invention covers more than this specific arrangement.

But this arrangement is not the one so largely employed at present by our telephone exchanges. The instruments used at opposite ends of the telephone wires are incapable of being used interchangeably as transmitter and receiver. In the present system of telephony an instrument similar to that shown in Figs. 4 and 5 is used as a receiver, but employed in this way it is difficult to see how it differs materially from Reis's receiver, invented, used, and published twenty years ago.

The Reis receiver, shown in Fig. 6, is familiar to all

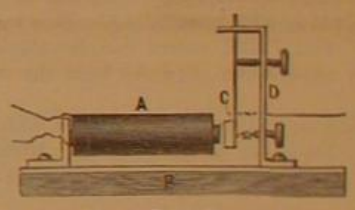


Fig. 6.—Reis's Receiver.

students of telephony, but the lack of patentable difference between it and the Bell instrument may not be apparent at first. In this instrument there are all of the essential elements of the Bell telephone—the magnet, the sounding board or diaphragm, and the armature, "capable of inductive action"—and while it can be used in its original form, as shown in Fig. 6, it may be simplified, whereupon the identical character of the instruments of Bell and Reis will at once appear.

The original Reis instrument (Fig. 6) consisted of an electro-

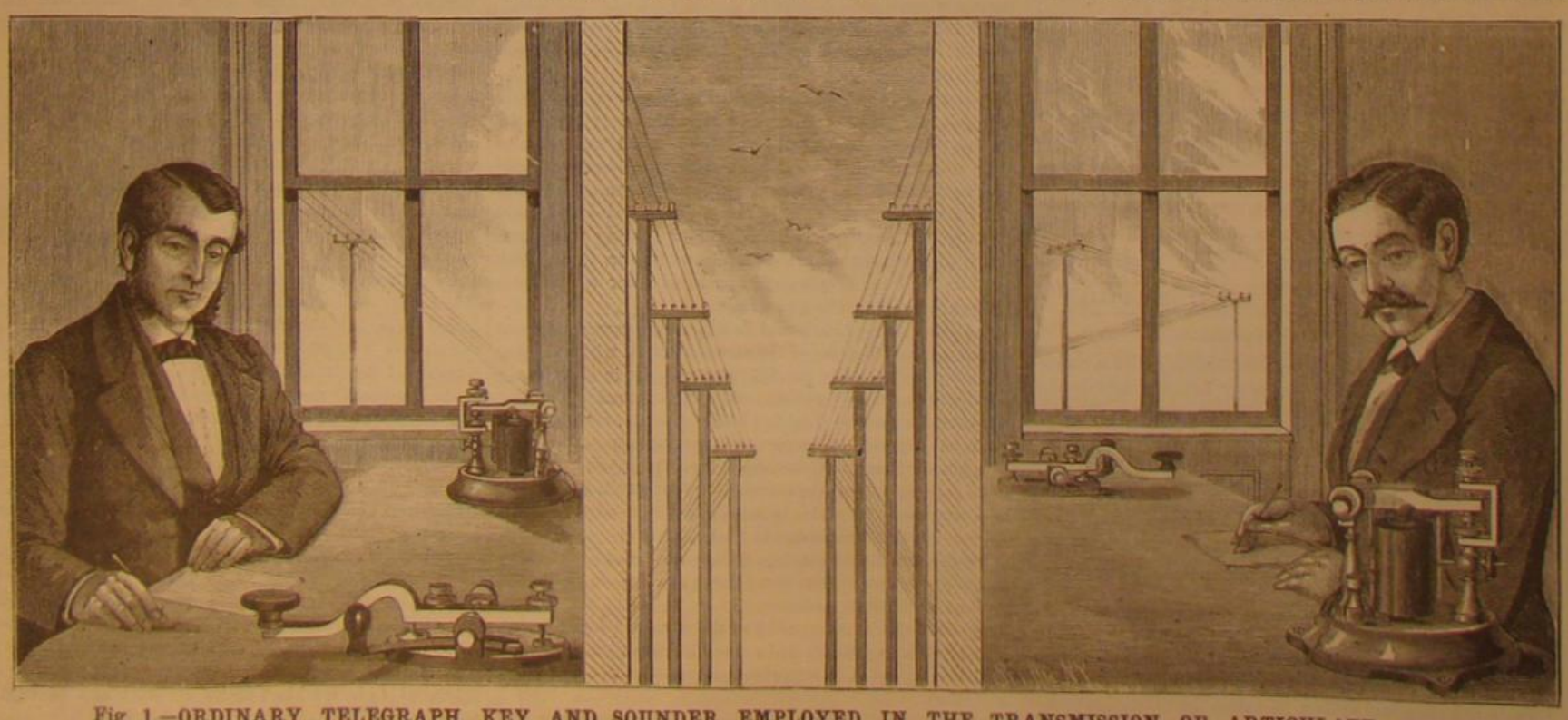


Fig 1.—ORDINARY TELEGRAPH KEY AND SOUNDER EMPLOYED IN THE TRANSMISSION OF ARTICULATE SPEECH.

magnet, A, mounted on a sounding board or diaphragm, B, and was provided with an armature, C, sustained by an arm, D, attached to the diaphragm. By dispensing with the adjusting screws and spring support of the armature (cutting them off on the dotted line in Fig. 6), and by attaching the armature directly to the angled arm, D, as in Fig. 7, an ope

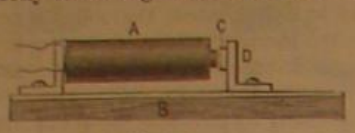


Fig. 7.

rative instrument is formed, which, although simpler than the original instrument, possesses no patentable features.

By straightening the angled arm, D, so that the diaphragm may be placed directly in front of the poles of the magnet, as in Fig. 8, the form of the instrument is further changed,

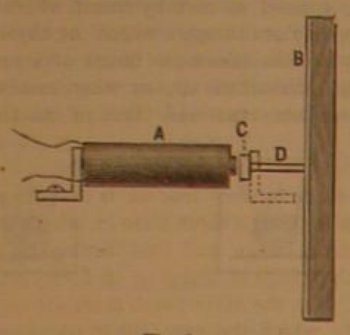


Fig. 8.

but it is substantially the same as the original. Leaving out the arm, D, and attaching the armature, C, directly to the diaphragm, B, is not an invention, and the instrument is still the Reis receiver.

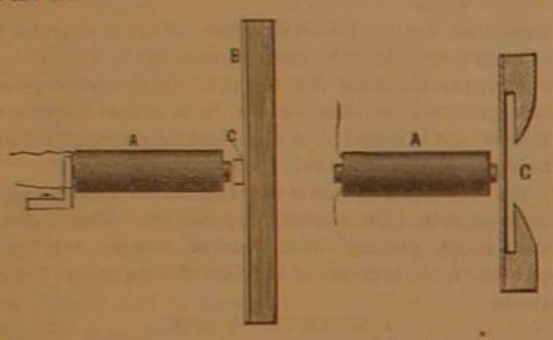


Fig. 9. Fig. 10.

Suppose the armature, C, to be flattened or rolled out so as to be capable of replacing the diaphragm, B, the instrument would then appear with but two of the original elements (Fig 10) viz.: the magnet, A, and the armature-diaphragm, C: it is still essentially the Reis receiver. Is it supposable that a valid patent can be obtained by omitting a few non-essential elements from the original instrument?

Reis's receiver was used in connection with a transmitter of his own invention, which was totally different from his receiver. The transmitter (Fig. 11) consisted of a box pro-

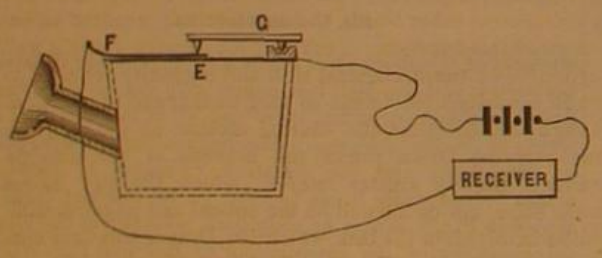


Fig. 11.—Reis's Transmitter.

vided with a mouthpiece, and covered by a membrane, E, carrying a platinum contact surface, F, which is touched lightly by a platinum point carried by the arm, G, one end of the latter resting in the mercury cup to make a perfect yet frictionless electrical connection. The platinum, F, and arm, G, are in the circuit with the battery and receiver, and the interruptions of the current take place between the platinum point on the arm, G, and the platinum, F, carried by the diaphragm.

Fig. 12 shows the essential members of the Blake trans-

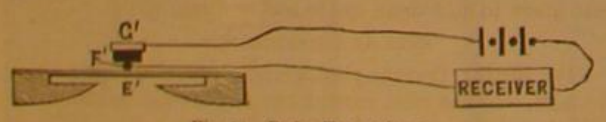


Fig. 12.—Blake Transmitter.

mitter, which is now used almost exclusively. It is hardly necessary to point out the similarity between this instrument and the one just described. The diaphragm, E', platinum contact, F', and spring arm, G', are substantially the same as the elements E, F, and G of the Reis instrument, the only difference being the substitution of a piece of carbon in the end of the arm, G', for the platinum in the end of the arm, G.

From what has been said it will be seen that the system of telephonic communication in use to-day is more Reis's than Bell's.

An Agricultural and Industrial Exhibition is to open on the 14th of September, 1881, at the exhibition grounds, Mile-End, Montreal. The prize list fills a pamphlet of 200 pages. Twenty-five thousand dollars in prizes are to be distributed to exhibitors. It closes on the 23d of the same month.

LIEBIG'S EXTRACT OF MEAT.

Baron von Liebig, Germany's great chemist, ascertained that the soluble constituents of 34 pounds of pure muscle meat (equal to 45 pounds of ordinary meat as it is received from the butcher) may be concentrated by boiling to 1 pound of extract, sufficient for the preparation of 190 parts of bouillon. With his keen perception he foresaw that the manufacture of this extract might become a great industry. He conceived the idea that the transmarine countries rich in cattle might become tributary to the necessities of Europe.

In the year 1850, at the beginning of the manufacture, the Royal Apothecary at Munich consumed scarcely one hundredweight annually, that is, one-tenth part of an ox, and Liebig himself did not imagine that in a score of years the number of cattle falling victims to this industry would number millions. This statement will not appear exaggerated when it is considered that in the summer season there are led daily to the slaughtering bench from one thousand to twelve hundred oxen.

The manufactory of Liebig's Extract of Meat Company lies on the eastern (left) shore of the Uruguay River in that state, and is as important to Fray Bentos as Krupp's great steel manufactory is to Essen.

Proceeding systematically, we should consider first the immense pasturing lands upon which the cattle peacefully graze. These cattle are children of the Pampas, descendants of the European cattle introduced by the Spanish conquerors. The large level pastures were especially suited to them, and here they increased greatly and now rove in innumerable herds.

For the manufacture of the extract the best pieces of meat are selected, for the simple reason that these pieces are the most profitable for the extract. When the animals are driven in from the Pampas to Fray Bentos they are kept for a week upon the pasturing places mentioned, where they are permitted to rest and feed. Then they are driven to the corrals, great inclosures capable of containing five thousand oxen; from here men mounted on horseback, swinging their lassos, drive the cattle by degrees into other smaller corrals, until finally the way is so narrow that the animals can only proceed one behind the other. A man stands at the side upon a staging with a short knife. With unerring certainty he strikes the animal close behind the horns into the spinal marrow. As if struck by lightning the animal falls dead upon a platform which rests upon wheels. The body rolls upon a track to the slaughter house, where with almost incredible celerity it is skinned and cut in pieces by skilled and practiced men. In less than seven minutes a whole ox is cut up. In the slaughtering season over five hundred men are employed, powerful fellows, who are very good hearted and harmless characters in spite of their bloody occupation, and notwithstanding the fact that their nourishment consists almost exclusively of meat. The dexterity with which they handle the knife excites astonishment. The meat is separated from the bones, as if the knife were guided through soft butter. One hundred and fifty to two hundred oxen can be handled in this way per hour.

The greatest cleanliness prevails. A plentiful supply of water is obtained from the river for washing. The slaughter house is roofed with iron and glass, and a railway connects it with the principal buildings of the establishment.

The raw material is conveyed in various ways from the slaughter house. The hides are salted, the horns stored, and the tongues are cooked and preserved in tin cans. The best pieces, as free from fat as possible, are used for the manufacture of the extract, while the inferior pieces are made into *tasajo* (meat salted and then dried in the air), which is a favorite article of food for the black population of Brazil and the West Indies. The fatty parts furnish material for the large tallow buying houses. The refuse and offal are dried and made into fertilizers.

The meat for the manufacture of the concentrated extract is freed from fat and gelatine, and passes through the following processes:

First it passes through four cutting machines, which discharge it into nine large wrought iron tubs, each one holding five thousand kilogrammes. In these the meat with an equal weight of water is heated to boiling. Then the liquid passes through pipes into an apparatus invented by Prof. Max Pettenkofer, where it is clarified and separated from the fatty part. Air pumps carry the remaining fluid mass into two reservoirs placed seven meters higher, from which it passes into the evaporating apparatus after it has gone through several straining processes.

The evaporating is effected in five large reservoirs, each having a hundred disks of the same material, which revolve in the liquid; then the extract remains quiet in other reservoirs until the next morning, when it is placed in two cast iron kettles surrounded by hot water jackets, each containing 10,000 liters of the extract, where it is reduced to a uniform mass. Then samples are taken which are subjected to the careful tests of the chemist of the establishment. If these turn out to be perfectly satisfactory as to purity, aroma, and consistency, the extract is packed in tin chests, each containing one hundred pounds, and sent to Europe. Packing the extract in small stone jars for the retail trade is done at the general depot in Antwerp.

The cooked meat remaining in the kettle is dried in the air, and with the addition of a few nutritive salts, and afterward being ground, is manufactured into the so-called meat-food meal.

Connected with the establishment are tin, locksmith, and joiner shops, a foundry, pump works, steam cranes, etc. The company import coal from England at a great cost, from 7,000 to 8,000 tons being consumed yearly.

Four thousand tons of salt are consumed yearly for salting the hides and tasajo.

The cattle slaughtered for the extract are at least four years old, as younger animals will not supply a strong extract.

It is unnecessary to speak of the great value and extensive use of the extract, as it is everywhere acknowledged to be a standard article.

ENGINEERING INVENTIONS.

An improved car axle box has been patented by Mr. William H. Taylor, of Richmond, Va. The object of this invention is to prevent journals of car axles from heating, and thus avoid the risk of danger and injury resulting from hot boxes on railroad trains. For this purpose the inventor provides for retaining water in contact with the box on one or more sides to dissipate the heat arising from friction.

An improved elevated railway has been patented by Mr. John G. Curtis, of Ludlow, Pa. The invention is more particularly intended for use inside of a building, to convey goods from one part of the building to another, and it may also be used for conveying goods from one building to another, or from place to place in a tannery or other extensive establishments. It consists in a novel construction, arrangement, and combination of an elevated rail or track, a two-wheeled truck, and a car or platform suspended from the truck.

Messrs. James F. Guild, of Dundee, County of Forfar, Scotland, and Arthur E. Knights, of New York city, have patented an improved steam steering apparatus. The objects of this invention are to move a vessel's rudder easily, quickly, and with perfect regularity, to have it completely under control and almost silent in its action, thus in a great measure overcoming objections to the usual steam steering apparatus, especially on passenger steamers; also to provide for steering vessels either by hand or power; to provide for the relief of the operative mechanism from the injurious effects of shocks by strokes of waves against the rudder, and to reduce the power usually required in apparatus of this character.

Messrs. John H. Reynolds, of Emerson, Iowa, Elisha P. Reynolds, of Rock Island, Ill., and Ben Reynolds, of La Mine, Mo., have patented an improved self-dumping trap which automatically discharges its load of earth or other material into any receptacle below its dumping platforms on the release of griping irons by the operation of a conveniently placed hand lever. The invention consists in supporting one or more pivoted dumping platforms, in an elevated framework, said framework supporting the upper end of "ramps" or inclined approaches thereto, whereon teams drawing loaded vehicles may ascend to the platforms to deposit their load of earth or other material thereon and descend therefrom.

An improved baling press has been patented by John Brown, of Memphis, Tenn. The object of this invention is to improve the construction of the baling presses for which letters patent No. 220,216 were granted to the same inventor October 7, 1879, to adapt them to be operated by steam power, and to make them more convenient in use.

The Presidential Cold Air Machine.

The apparatus which proved most satisfactory in cooling the chamber of the wounded President was furnished by a Mr. Jennings, of Baltimore. It was devised for use in a new process of refining lard. According to the inventor's description the apparatus consists of a cast iron chamber, about ten feet long and three wide and three high, filled with vertical iron frames covered with cotton terry or Turkish toweling. These screens are placed half an inch apart, and represent some three thousand feet of cooling surface. Immediately over these vertical screens is placed a coil of inch iron pipe, the lower side of which is filled with fine perforations. Into a galvanized iron tank, holding 100 gallons of water, is put finely granulated or shaved ice (and salt when a low temperature is required). This water is sprayed upon the sheets in the lower tank constantly. In each end of the iron chamber are openings thirteen inches square. To the outer end of this chamber is a pipe connecting with an outdoor air conductor. To the opposite end is connected a similar pipe leading into an ice chamber at its top, and from the bottom of the same a pipe leads to a small exhaust fan, and from the fan the now cold and dry air is forced direct into the President's room through a flue some twenty feet it length. Air at 99 degrees temperature to day is supplied at the rate of 22,000 cubic feet per hour at the register in the President's room at 54 degrees, and with the windows and doors open the temperature at the President's bed (twenty-five feet away) is maintained steadily at 75 degrees day and night. When the cold air machine was introduced it was intended to keep the windows and doors closed, and under these conditions the machine would create and maintain a temperature of 60 degrees in the hottest weather without using the auxiliary ice-air chamber now used, which was the suggestion of Professor Newcomb and Major Powell, to meet the requirements of cooling the room with the doors and windows open. The closing of them gave the room an air of gloom. An extra ice chamber fan and engine has been put up in a room opening into the hall near the first apparatus, to be used in case of accident and to cool the corridors of rooms adjoining the President's.

STEAM BOILER NOTES.

The reports of the chief engineers of the English boiler insurance companies of Manchester have been published and contain much useful information for steam users. Mr. McDougall, of the Boiler Insurance and Steam Power Company, claims to have made 13,071 thorough internal examinations and hydraulic tests, and to have had not one explosion and but one serious collapse among the 20,000 boilers in his care. The passage of the Employers' Liability Act, he thinks, will greatly extend the operations of boiler insurance companies, and should tend to effect a great improvement. Mr. Lavington E. Fletcher, chief engineer of the Manchester Steam Users' Association, in his monthly report, states that 971 boilers were examined from May 28 to June 24, of which 467 were thorough annual inspections.

The discussion of the subject of flat cast iron boiler heads is still going on in Philadelphia, and the interest seems to increase. The *Iron Age*, possibly speaking by authority, repeats the assertion that "the Hartford Company have instructed their agents in Philadelphia not to approve boilers with flat cast iron heads with a greater diameter than 36 inches;" but says, "the company do not wish this action to be construed as indicating a desire not to accommodate manufacturers; but in view of the recent verdict of the coroner's jury, in the case of the explosion at the dye works of Gaffney & Dolan, they do not care to continue writing on this class of boilers."

Since the experimental bursting of a duplicate of the Gaffney boiler head by the makers, Sidebotham & Powell, on the 13th of July, as suggested in our "Notes" of July 2, to the jury, and illustrated in the SCIENTIFIC AMERICAN of July 30, the inspectors of Philadelphia seem to have plucked up courage, especially the city inspector, Mr. Overn, who has been prompted by a lawyer, the city solicitor, to stand on his dignity as a mechanical expert, and he accordingly appears, by the *Ledger*, to say that he regarded the test as a satisfactory test as to the strength of cast iron in the ends of the boiler." The cast iron held good up to 450 pounds, and under this showing he (Overn) would have no hesitation in giving a boiler, with the same quality of cast iron, a pressure of 80 pounds to the square inch."

It is due to this gentleman to say that this is perfectly in accordance with his faith before the Gaffney explosion, but a misinterpretation of the cause of that accident by some experts shook his faith in his own judgment.

Some instances of apparent hardship to owners of steam boilers since the flat head controvery began are given in the *Philadelphia Record* of the 16th of July. The lumber mills of Van Horn & Son, at Whitehall, have been closed since the 11th inst., and are likely to remain so, waiting a city inspector's certificate. The machinery of this firm had been running night and day to fill orders, and the loss, besides the cost of new boilers, is represented as being heavy. Cause, 36 inch flat cast iron heads in their 42 foot boilers. Borie & Mackay, Frankford, have received similar treatment from one set of inspectors, while the other passed them so they could continue work. A large number of other boilers have lately been refused certificates, and when this is done by the city inspector they must stop. Messrs. Garsed & Co., large manufacturers of cotton yarns, in Frankford, were compelled to throw out four boilers 80 feet long, while 40 feet of the furnace end of them that were removed fourteen years ago are said to be running now under inspection. It may be urged by the inspectors that these 80-foot boilers are dangerously long, but they have an exceptionally good arrangement of supports, which has served for over thirty years to prevent undue strains from sagging. They rest at the ends upon solid supports. Two sets of four volute steel car springs are placed upon heavy arched girders, at S S, that span the boiler settings at such intervals as to make even and elastic supports, thereby preventing undue strains on the lower side of the boiler from slender proportions.

These four boilers were built by Brooks and Stanhope, in 1850, John Powell (now of Sidebotham & Powell) foreman, and for many years after they were put to work the engineer used leaden gaskets for the man-hole joints, and he had a habit of adjusting his plate and gasket when closing the boilers and screwing up pretty hard. But if the joint was not tight after raising steam, he was accustomed to beat the head with a heavy sledge near the gasket seat, to settle the uneven plate upon the lead and make it steam-tight. The marks of this violence are still plainly seen on the castings, which are about the same thickness and style as the Gaffney boiler heads.

The *Ledger* also credits Mr. Overn with the remark "that he was inclined to believe, from what he had recently observed, that eventually the city would have the entire work of inspection, for he thought the Hartford people would drop the inspection department of their business and confine themselves solely to insurance, relying on the city's inspection."

It naturally occurs to lookers on who feel an interest in the subject to inquire why the verdict of an unfriendly jury should make a breach between an insurance company who have heretofore been not only willing but desirous of insuring, and the friendly manufacturers who were willing and desirous of having them insure boilers that have during their experience proved as safe as any of that type. The Philadelphia *Record*, in commenting on the flat head muddle and its effect on the manufacturing interests since the Gaffney explosion, says: "Nearly two-thirds of the boilers in use in the suburbs have flat cast iron heads, and the owners are in daily fear that an edict will be promulgated which will put a temporary stop to their operations."

We learn that a boiler explosion took place about the 19th of July, 1881, at Watertown, near Marietta, Ohio. The boiler of a saw mill was blown to atoms. Hiram Brockway and Eugene Barclay were instantly killed. Three others, Isaac Johnson, Robert Alexander, and William Conner, were fatally injured. Johnson has since died.

The June number of the Hartford Steam Boiler Insurance Company's circular contains the inspector's report for April, 1881, by which it appears that 3,960 boilers were viewed, of which 1,593 were inspected internally and externally, and 528 dangerous defects were found; notable among them were 23 safety valves in dangerous condition, and 74 boilers without steam gauges. 39 boilers were condemned in April. There is also notice of 8 explosions in May, and one illustrated explosion that occurred in 1877, in Brooklyn, N. Y.

MISCELLANEOUS INVENTIONS.

Mr. William A. Thompson, of Brooklyn, N. Y., has patented an improved fire escape, which consists of a cradle formed of curved side bars connected by cross bars and provided with supporting bars or legs, the cradle being hinged to a rod attached to the window casing below the sill, and having a ladder attached to its free end and provided with means whereby the fire escape can be extended from the window when required for use, and folded down inside the window when not required for use.

An improved baling press has been patented by Mr. Nelson Arave, of Hooper, Utah Ter. The object of this invention is to press hay and other materials in successive bales by the continuous forward movement of the driving mechanism.

Heretofore alloys, in which lead forms a component part have been used for coating cast and wrought iron to protect the same against oxidation, and zinc and tin alone are in common use for this purpose; but several objections and difficulties attended the use of these materials when applied by the methods now known—as, for instance, when zinc or tin is used and applied directly upon the iron the zinc attacks the iron in such manner as to injure its durability and tenacity, and this is also true of such alloys as antimony, bismuth, and lead, and nickel, tin, zinc, and lead; and, besides, in applying these alloys or the zinc a dross is formed in the molten baths, which is troublesome to remove, and results in a loss of metal, and wrought or cast iron has never been successfully coated with unalloyed lead. Mr. William Frishmuth, of Philadelphia, Pa., has patented a process of thoroughly and effectively coating cast iron or sheets of wrought or cast iron or other metals with pure lead, or with zinc or tin, in such manner that the metal coated will be protected against oxidation and its durability and tenacity preserved, and in such manner that there will be no formation of dross in the molten baths. The invention consists essentially in protecting or preparing the surfaces to be coated by depositing upon them, by electroplating or otherwise, a thin coating of nickel, or an alloy of nickel and aluminum.

It is well known to workers of gold and silver ores that the pan amalgamation process always results in a very considerable loss of the precious metals and of the quicksilver, the loss of the former being in a great measure due to the fact that the particles of metal are coated with some substance that repels the quicksilver or prevents its contact with the metal, and the loss of the quicksilver being principally due to the "flouring" of the latter, because of its trituration in the pans and because of the presence of certain interfering mineral substances that coat the globules of quicksilver and prevent their reunion. Messrs. William H. C. Mathews, Charles W. Ayres, and Madison D. Campbell, of Bodie, Cal., have patented a cheap and effective compound to be used for preventing this loss of both the gold and silver and the quicksilver, by brightening the particles of the precious metals and by preventing the coating of the quicksilver globules.

An improved apparatus for separating sulphurets in ore washing has been patented by Mr. William F. Devan, of Gwin Mine, Cal. The object of this invention is to improve ore washers and save the sulphurets by an operation that is both continuous and economical.

An improved bird cage has been patented by Mr. John B. Abernathy, of Covington, Ky. The object of this invention is to protect the animals confined in cages from suffering by external violence and from being preyed upon by larger animals.

An improved adjustable piston, which is so constructed that the packing of the same can be depressed and spread proportionately as it wears off, by adjusting the piston accordingly, so that the packing will always fit closely in the pump-cylinder, has been patented by Mr. James Preston, of New York City. A packing of any desired size is held between the opposite convex or flat conical surfaces of the plates, and in case this packing becomes worn off it can be spread by forcing the disks toward each other.

The Eyes of Science.

In a communication to the *Herald*, describing the wonders of the eyes which science has fashioned—telescopic, microscopic, spectroscopic, and, most marvelous of all, photographic eyes—Mr. Richard H. Proctor says:

Ordinary human eyesight, even when strengthened and extended by optical devices, possesses certain imperfections and is used under certain difficulties. For instance, at least a tenth of a second is required for the eye to take a full look at any object. Even if the eye could see an object in less time the image remains at least this time impressed on the retina. Thus the eye cannot see an object which moves very rapidly, and even when an eye sees an object moving not too rapidly, or moving in a circle so as continually to renew the impression (as where a burning rod is whirled round in a dark room), the object is not seen as it really is, but the successive images, owing to the persistence of luminous impressions, are blurred together into an image utterly unlike the real object. Again, when an object is rapidly changing in shape the eye is often quite unable to see distinctly any one of the shapes which the object assumes. Thus scarcely one of the attitudes of a galloping horse can be seen by the human eye, insomuch that the finest pictures of a charge or a race show not one attitude which a horse really assumes when galloping. Yet again, the eye is often prevented from recognizing the true shape of an object which is itself at rest, by reason of continual fluctuations in the medium through which the object is seen, as for instance when the telescopic image of a sun spot is examined through disturbed air, or when smaller details of the solar surface are examined through the air at its very stillest.

OPTICAL DIFFICULTIES.

In all these cases the real trouble is that the eye requires a certain definite though short time in which to take in, as it were, the visual image, and that during this time the object forming the image is changing in form, either actually or apparently. On the other hand, there are cases of an opposite kind, in which the eye fails to recognize objects or their details because of their exceeding faintness, the eye gaining nothing by the length of time during which it is in action. Thus if we look at a point in the heavens at night where there is a telescopic star the eye fails to see that orb if directed toward it during the tenth of a second (the period necessary for distinct vision under ordinary conditions), nor can the eye see the orb better if directed toward it for a second or for a minute or for an hour. Now science possesses an eye free from these defects, by means of which ordinary vision may be made to see an object as it would be seen if the human eye could take in the image in the thousandth part of a second, or even less time, or, on the other hand, as it might be seen if the human eye could look steadily for an hour or more, gaining distinctness of vision precisely in proportion to the increase of the time during which the eye was used.

A LIGHTNING GLANCE.

For instance, in lecturing on the sun I have been able to tell my hearers that a certain photograph of the sun's surface had been so rapidly taken as to show details which no astronomer had ever actually seen or could see, even though he used the most powerful telescope ever made, and gave to the study of the sun with such an instrument every moment of his working life

A LONG GAZE.

On the other hand, but a few weeks ago I was looking in Dr. Henry Draper's observatory at a picture of the great nebula in Orion which had been two hours and twenty minutes forming itself on the retina of the photographic eye of science—in other words, the negative had required an exposure of this duration. I say nothing, though I might well say much, on the mechanical skill and ingenuity required to retain the telescopic image so long unchanged in position, though all the time the diurnal motion of the heavens was carrying Orion round the heavens at the rate (in reality a slightly greater rate) at which the sun moves in the skies, nor do I dwell on the optical and physical difficulties involved in the task which Dr. Draper had thus successfully achieved. The point I wish chiefly to dwell upon is this, that where such a photograph is taken science does in reality employ an eye which can give hours to a single look. And let it be noted that we see now but the beginning of the use of the photographic eye, which can see in the five-thousandth part of a second if need be, or if need be can rest its gaze for many hours on the same object, seeing more and more as minute after minute passes on. Yet already the swifter view of the photographic eye has shown details which the unaided human eye, or that eye aided only by the telescope or microscope, could never see, while the steadfast gaze of the photographic eye has revealed what it has been given to no human eye to see by direct vision.

SEES AND DELINEATES.

Note, further, that the photographic eye in seeing, delineates also, whereas often enough the eye keenest to see is but little skilled to guide the hand to delineate what is seen, and yet oftener the ordinary eye can obtain but so brief a view of an object that there is no time to draw what is seen without trusting to memory, which in such matters is too often treacherous. The finest picture of the solar rice grains as drawn by any human artist has much less value than have Janssen's instantaneous photographs of the sun's surface. The best picture of the great Orion nebula—which, despite Mr. Delarue's opinion in favor of the view taken with Lord Rosse's telescope, I consider to be unquestionably Mr. Trouvelot's picture taken with the great Washington telescope—shows no details which are not clearly recognizable in Dr. Draper's beautiful negative, while skillful though Mr. Trouvelot is as an artist, nature has surpassed him in presenting truthfully not only all details but all grades and varieties of shading. And these are but illustrative instances, belonging, too, but to the beginning of the application of photography to science.

IMPROVED CAR STARTER.

No subject is more deserving of the attention of inventors than that of starting our heavily laden street cars after they have come to a full stop, and singularly enough no subject has been more bunglingly treated. The two essential qualities of a car starter are simplicity and durability. Complicated and expensive mechanism for this purpose is entirely out of the question, as no class of devices are subjected to greater wear or greater inequalities of strain.

The car starter shown in our engraving happily combines all the essential qualities, and has proved itself by actual and continued use to be adequate to all the requirements of a device of this character. The clutch employed is of novel construction, and the leverage is equal to the radius of the wheels.

In the engraving Fig. 1 is an elevation of a portion of a car, showing the clutch of the starter in section. Fig. 2 is an inverted plan view. Fig. 3 is a perspective view of the clutch and clutch lever, and Fig. 4 shows the inner end of the clutch lever.

The axle, A, with which the apparatus is connected, has attached to it a sleeve, B, and a clutch, C, which may be rotated around the enlarged central portion of the sleeve.

In connection with this clutch there is a lever, D, the central pivoted end of which is pivoted in a slot in the clutch, C, in such a way as to have freedom of motion to a certain extent up and down. Upon the outside of this central portion are winged flanges which embrace the sides of the clutch, C. A pivotal pin, passing through these wings as well as the central portion, and clutch, C, give steadiness to the lever, D, and prevent it from lateral movements. At the extreme inner end of the lever, D, there is a recess, of a semi-globular form, elongated in the direction of the length of the lever. A ball, *a*, having freedom of movement, is placed between this recess and groove, around the central portion of the sleeve, B. This ball, in the movement of the lever at the proper point, is clamped against the groove, and, having freedom of movement in its own recess, presents continually a new wearing surface, and avoids the inconvenience and bad results which would follow if no such ball were employed.

By reason of the longitudinal form of the recess, the ball, in the upward movement of the lever, is brought into engagement in the upper part of its recess with the groove in the sleeve, and therefore the resistance of the ball, being in a slightly angular direction, is increased to such an extent that it never slips.

The outer end of the lever, D, is slotted to receive the link of the chain, E, which is held by a bolt, so that if it is necessary to shorten the chain at any time the bolt may be withdrawn, and then replaced through another link of the same chain. The chain, E, passes over a pulley secured to the bottom of the car, is attached to a rod, F, which, in turn, is attached to the draw bar, G, by a pivotal connection. The inner end of the draw bar connects with one end of the lever, D, pivoted to the bottom of the car, and a spring, with this lever between its pivotal point and its free end, presses it back, and draws back the draw bar, and holds it in this position when no force is applied to it.

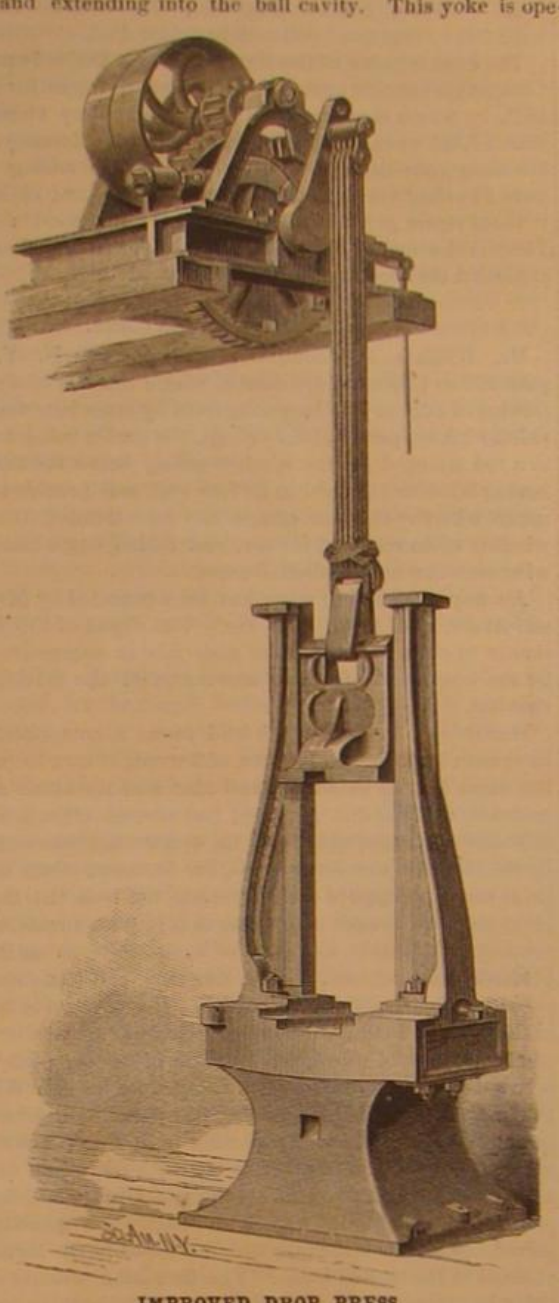
It will be seen that with any forward motion of the draw bar the lever, D, will be raised, and the power for the moment will be exerted to great advantage, and the car will be started easily without strains or shocks on the horses, harness, or car.

To check any retrograde movement of the car upon up grades, an auxiliary ball, *b*, is placed in a cavity in the clutch, C. When the car makes the slightest movement backward the ball, *b*, wedges in the cavity and stops the car.

The starter is not intended to supersede the brakes, but to be used as supplementary to them. The main object is to lessen the labor of overcoming the inertia at the initial of the forward movement, and also to equalize the draught after the loaded car has been put in motion.

There is also an attachment by which the driver is enabled to reverse his car by throwing the lever out of gear—and preventing the locking of the wheel—simply by a pressure of the foot. If by any neglect on his part he should fail to put it in gear again, it acts automatically as soon as he attaches the horses to the draught bar.

The ball of the checking device is thrown out of position to engage the clutch by means of a rod attached to the yoke, H, and extending into the ball cavity. This yoke is operated by a pedal, L, through the medium of the angled levers, K, I, the rod, J, and a short section of chain connecting the double arm of the lever, I, with the yoke, H. By means of this mechanism the checking device may at any time be thrown out by the pressure of the foot on the pedal, L, and should it be desirable to keep it out of engagement with the clutch, the catch on the pedal is hooked under a plate in the platform.

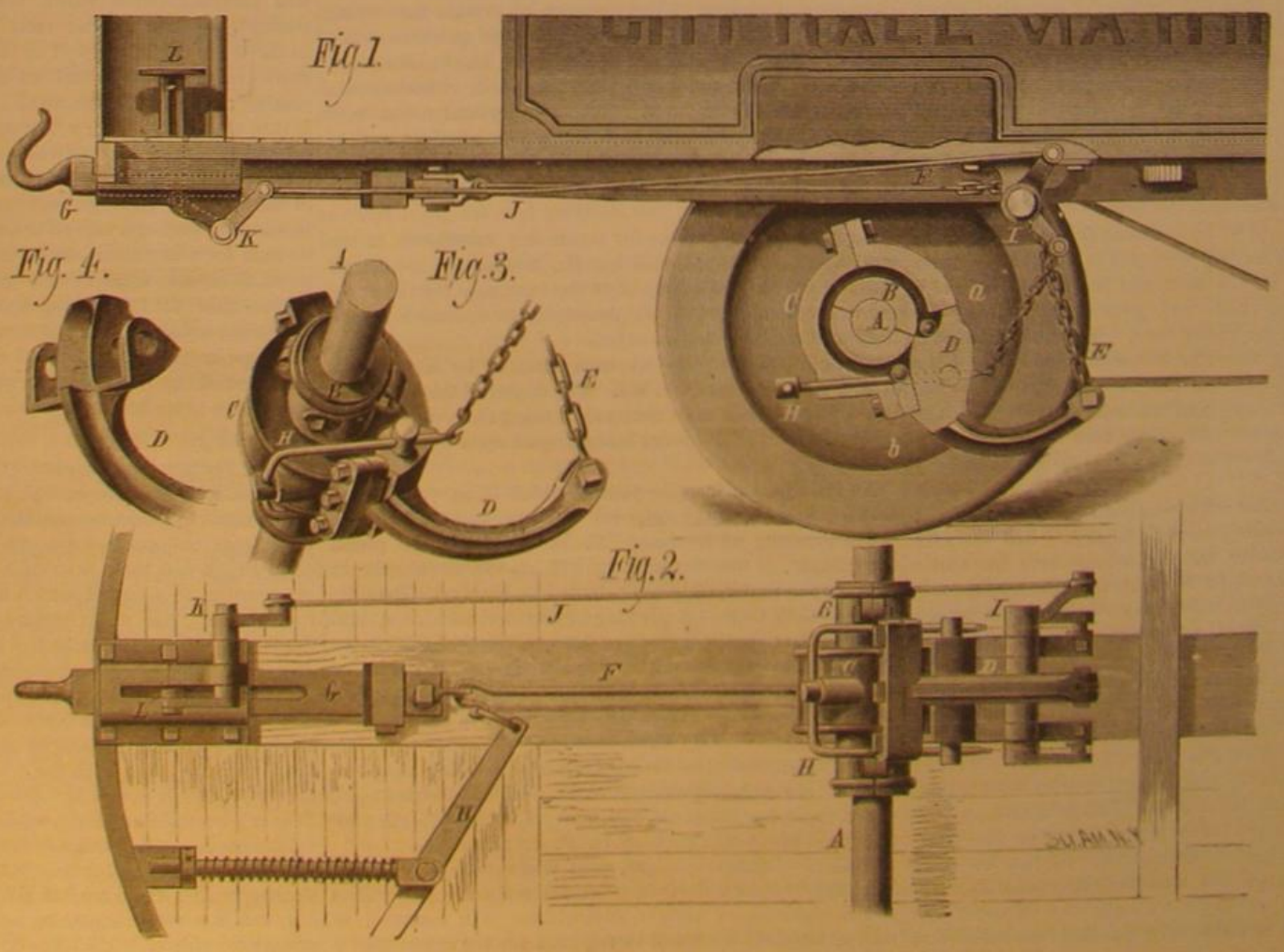


IMPROVED DROP PRESS.

One of the great advantages gained is that it removes the concussion from the car, preventing the sudden jerking of passengers inside when the car starts up. So smoothly does it start that even a lady could get on at the time without inconvenience. Another advantage is that passengers standing up are not jostled and thrown around the car, as all the jerking and pitching is done away with. The explanation of the matter is simply that it moves the car to move the load, instead of moving the load to move the car.

This improved car starter is in continuous use on some of our leading horse-car lines in this city, giving great satisfaction. This starter has been applied to some of the car lines in Baltimore with great success, and it should meet the approval of all street railroad companies.

Further information in regard to this useful invention may be obtained by addressing P. B. Shaw, Grand Hotel, 31s street and Broadway, New York city, or the American Car Starter Co., Williamsport, Pa.



HILL'S CAR STARTER.

NEW DROP PRESS.

The variety of work that can be welded and forged under a drop press, and the great economy and rapidity with which it can be done, have worked a complete revolution in the production of steel and iron shapes. In no other way can duplicates be made so surely to replace missing or broken parts.

We illustrate a new drop press which is a great improvement over those now in use. The patent connection between the crank pin and hammer is slightly elastic and acts as a cushion.

The right tension can be much easier attained and changes can be more readily made than with the strap in common use. Its first cost is less, and when worn out can be quickly replaced at a small expense. We are informed that quite a demand has arisen for this connection to replace old straps on lifters of drop presses of other manufacturers.

Internal steel ratchets—whose teeth are much stronger than those of external ratchets—are used in constructing this press, and the ratchet being attached to the rim of the main driving gear the transmission of the strain through the arms of the gear wheel is avoided. The greatest strain on crank and ratchet drop presses comes when the dog fails to catch a tooth at its furthest rebound, then it falls back to the next tooth. This ratchet contains forty-five teeth, and hence the falling back in this machine is always through a very small distance. This press is manufactured by Williams, White & Co., Moline, Ill.

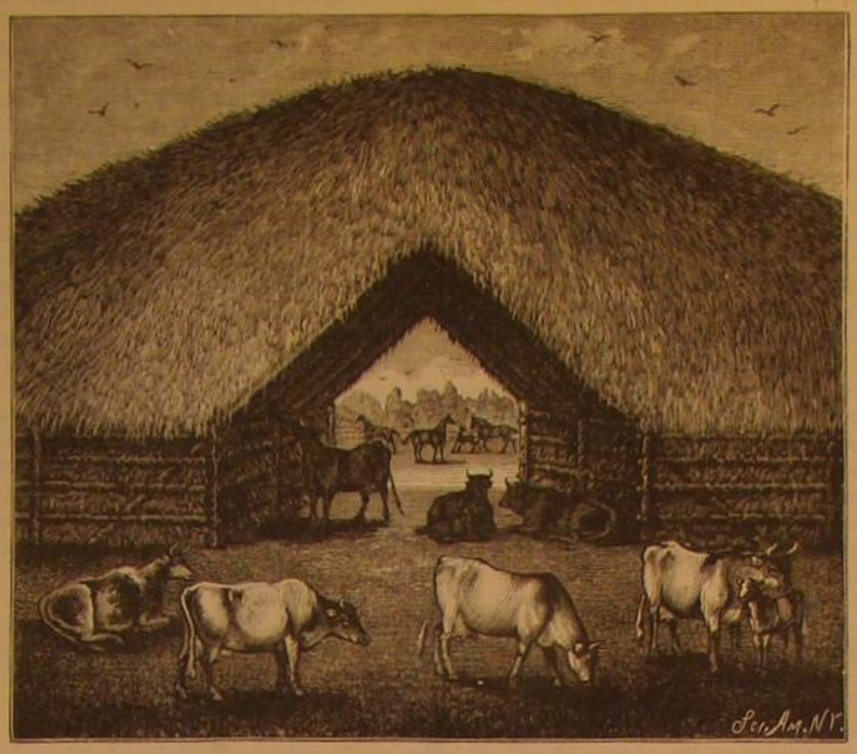
Steam Wagons.

The Colusa *Sun* says: "After all his experiments, Captain Roberts, of the San Joaquin Company, is still an enthusiast about his steam wagon enterprise. We had a conversation with him some time ago, and he thinks that roads suitable for his wagon can be built very cheaply. While the wagons run and pull very heavy loads on common roads, he thinks of digging two small graded ditches and filling with gravel, which will pack as hard as iron, and give a solid road for each of the broad wheels, and for the wagon wheels that follow with the loads. The Chico *Enterprise*, of Tuesday, has an item to the effect that this 'steam wagon has been thoroughly overhauled and improved at the Union Iron Works, Sacramento, and on a recent trial worked satisfactorily. Its weight is 17 or 18 tons, and it is calculated to haul 50 tons of grain at each trip. It will be taken to the Upper Sacramento valley in a day or two, and will engage in grain hauling between Riceville and McIntosh's Landing.'

"Capt. Roberts will, if this one shall prove the success he anticipates, put on wagons to run to all the principal landings on the river, and thus cross-section the entire Sacramento valley. He will have, in effect, a freight railroad across the valley, from foothill to river, every eight or ten miles. We sincerely hope that the wagons may prove successful, as it would be one of the grandest things for the Sacramento valley that could be imagined; that is, always provided we can keep the river navigation from being destroyed."

SHELTERING HAY RICK

A straw or hay rick that can be used as a shelter for cattle, horses, etc., is shown in the annexed engraving. The frame of the stack consists of two square fences with a passage way between them. The passage is covered by a peak roof framed or tied, the rafters being formed of fence rails or thick poles, with their lower ends set a small distance in the ground. The hay is placed in the spaces inclosed by the fences and upon the rafters, and the stack is built up to the ordinary height. Very long stacks can be provided with two passage ways if desired. It is considered advisable to construct the frames of these hay stacks as permanent structures.



SHELTERING HAY RICK.

Pharaoh's Serpent and the "Sea Snake."

We have heard a good deal about the amusing chemical toy "Pharaoh's serpent," both harmless and injurious, from its unhealthy vapors given off in the process of burning, but little about another very ingenious and singular chemical phenomenon, discovered and exhibited by the late Prof. Graham, Master of the Mint, which might be termed, in contradistinction to Pharaoh's land serpent, the "sea snake," as it is produced under water. His experiment went to show the prodigious amount to which the metal palladium will absorb hydrogen: an amount exceeding by some hundreds of times its own bulk. Two ribbons of palladium, attached to the two poles of a battery, were seen loosely coiled in a water bath. The current was turned on; the ribbons took in so much hydrogen that they expanded, uncoiled, and stretched themselves across the bath, as if alive. The current was reversed, the hydrogen was thrown off, and the ribbons resumed their coil. They might have been compared to a couple of writhing worms. The sight was amusing; but it exemplified the researches by which Prof. Graham has thrown light on an important question in cosmical science, and led him to the discovery of the metal to which he has given the name of "hydrogenium." "What do you think," wrote the Professor to Hofmann, "of a metallic hydrogen, a white magnetic metal?" The condensation of hydrogen in palladium, and the discovery of the occlusion of hydrogen in meteoric iron, confirmed the conclusion to which spectrum analysis had previously conducted us, that the meteorites came from an atmosphere of incandescent hydrogen existing under very considerable pressure. Graham's fame as one of England's greatest chemists justly rests upon this important discovery.—*Monthly Magazine.*

THE SEA LAMPREY.

The lampreys form a small group of hardly more than a dozen varieties, and are the most imperfectly developed, and occupy the lowest grade of all fishes, with the exception of the Lancelet. Their skeleton consists entirely of cartilaginous material. They are destitute of ribs, shoulder girdle, real jaws, and scales, and are possessed of only one nostril, and their gills have the form of fixed sacs. In their habit of feeding and attaching themselves to the bodies of other fish, from which they rasp off the flesh and suck the juices, they become very suggestive of the leech.

The body of the sea lamprey is olive-green, mottled with dark brown. Length from two to three feet; numerous rows of mucous ducts on the head and body. The mouth, when not attached to any object, forms a longitudinal fissure; when attached it is circular in form. The teeth are of various kinds, generally disposed in concentric circles. In the throat, and partially closing it, is a group of three large teeth. (See illustration.) Lips fleshy, with a distinct and slightly fimbriated membrane, and beneath a deep triangular fossa, having a fold on each side.

Lampreys are frequently found attached to sturgeon, from which they suck the slime and mucus exuded in abundance through the pores of the sturgeon. All the skate family provide favorite food for the lampreys, in whose bodies they rasp out deep wounds, which often produce ulcerations. The young pass through several changes before becoming perfect lampreys. At first the young are destitute of teeth and have only rudimentary eyes.

With the Italians and French the lamprey is considered a great delicacy, whereas in England only the poorer classes eat it. In this country it is valued only by a few epicures, and is rarely seen on the fish stands. Sothern, the actor, considered it a great luxury, and was known to pay very high prices to obtain it, being of the opinion that it contained more brain food than any other fish.

It is related of the Roman emperors that, so great was

MOUTH AND TEETH OF SEA LAMPREY.

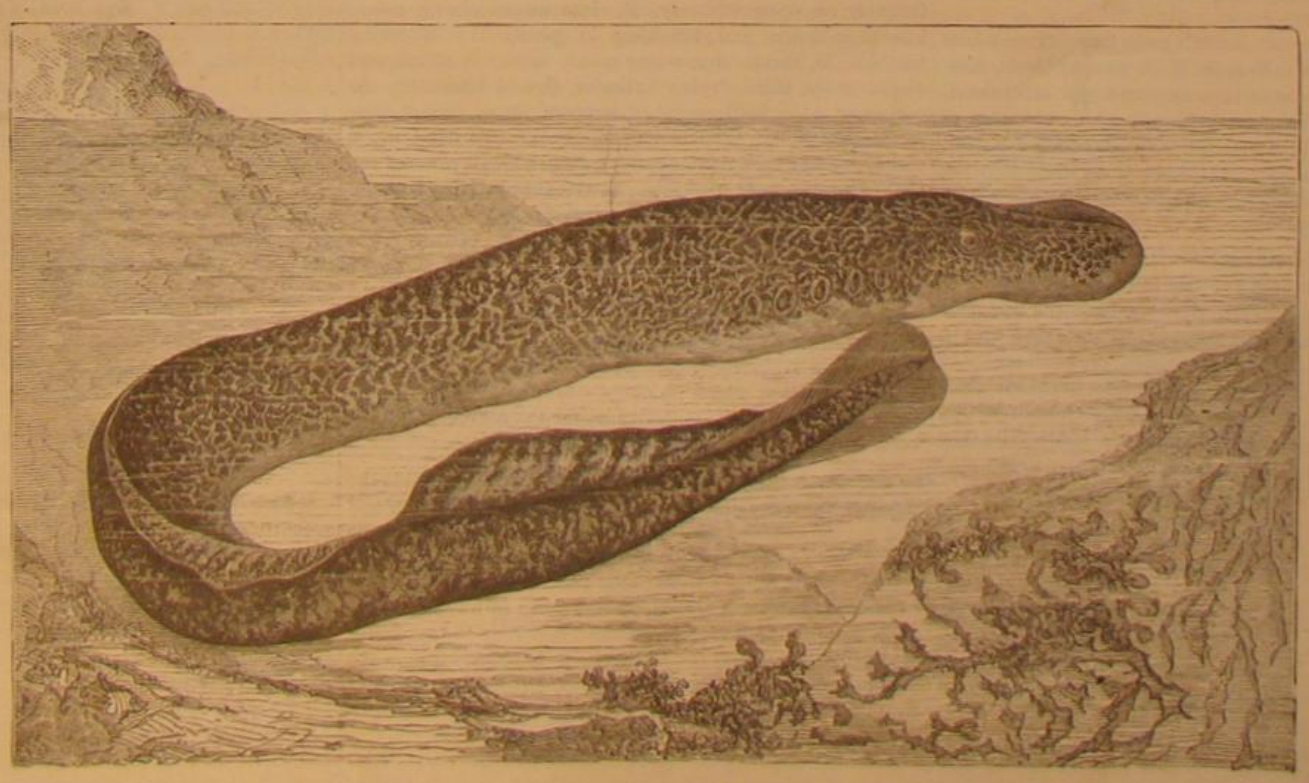
their valuation of the lamprey, both as a luxury and stimulating food, artificial ponds were constructed in which to fatten the lampreys, the principal food used being well fattened living slaves, on whose bodies the eels would fasten and feed, affording an enjoyable pastime to the noble Roman.

The only place in New York city where the lamprey is served up is at the Grand Union Hotel.

At the next dinner of the Ichthyophagous Club, the sea lamprey will receive special attention from the French cooks, and is to be served in every known style.

The negroes of the South have great respect for the lamprey eel on account of its supposed medicinal qualities, the skins being in great demand as infallible cures for rheumatism and kindred ailments. The skins are bound about the ankles, wrists, and neck of the patient while fresh from the body of the eel, and are worn for long periods of time, in fact often till they drop off.

In the months of March and April the lampreys begin ascending our fresh water rivers and streams that empty into salt water. Here they construct what might be called a nest, composed of stones piled up in a heap. These stones are carried from a distance by means of their sucking mouth. In these conical heaps of stones they deposit their spawn.



THE SEA LAMPREY.

Botanical Sources of Tonga.

Some time ago a native medicine called "tonga" was introduced into England and the United States from the Fiji Islands, where it has long been in use as a remedy in neuralgic affections. No clew to the origin of this drug, which belongs to the vegetable kingdom, has hitherto been obtained, as the natives have jealously guarded the secret. According to a recent number of the *Gardeners' Chronicle*, however, the botanical source of the medicine has now been found out through specimens sent by Mr R. L. Holmes, and submitted to Baron Von Mueller for identification.

The component parts of tonga consist of two plants only. The first, called by the natives "Aro," is *Premna taitensis*, and belongs to the order verbenaceæ. Mr. Holmes states that it is, in open dry places, a shrub, flowering when quite small, but near water-courses becomes a tall tree, the timber of which is used in building, the inner bark being the part used in medicine. The other plant, known as "Nai Yalu," or "Walu," is an Arad, the *Raphiodophora vitiensis* of Seemann. It is a creeper, growing freely in sheltered places, climbing over stones and the like till it finds a tree, when it changes its nature. From a small vine, not thicker than a quill at the foot of a tree, it gradually expands, the stem growing to one or two inches in diameter, and the leaves, as many feet long, become pinnatifid, forming a handsome plant. It is the dried scraped stems of this plant that form the second ingredient in tonga.

Preservation of Flowers with their Natural Form and Color.

One of the processes consists, says *La Belgique Horticole*, in inclosing the flower or flowers in a glass jar provided with an air-tight, hollow ground-glass stopper, the cavity of which is filled with quicklime wrapped in leather. The object of the lime is to absorb the small quantity of humidity already existing in the jar or which might enter on a removal of the stopper. The dry air, deprived of its carbonic acid, occupying the jar, seems to brighten the color of the flowers and preserves them in their natural colors.

Mr. Cornelis's other method consists in burying the flowers carefully in sand and then drying them. The most convenient receptacle that he finds for this purpose is a piece of paper wrapped in the form of a cone, the point being bent over so as to form a truncated cone. The desiccation may be effected at a temperature of 90° to 100°, but the method which gives the best results is desiccation in a vacuum in the presence of commercial sulphuric acid or any other substance which absorbs water with avidity, such, for instance, as chloride of calcium or caustic potash. The flower once dried, which will be in eight or ten days, it must be removed from the sand with great care, for it is very fragile. The dust remaining on the petals is removed by allowing coarse sand to fall upon them from a small height. After this species of washing the specimen has received all the treatment necessary, and in this state may be preserved indefinitely if it be inclosed in a hermetically sealed jar along with a little quicklime.

The preservation of color in dried flowers, however, will not in all cases be attended with success, the action of light upon them being very variable. Certain kinds stand the light perfectly—even the direct light of the sun; others are even influenced by a diffused light, and there are some again that are discolored even in partial darkness. Three plants, *Abutilon sellowi*, *Fritillaria imperialis*, and *Vanda suavis*, exhibit an unlooked for phenomenon. When dried, these flowers become of a reddish-brown, but when they are exposed to the sun they assume a tint which is quite like their original one, except *Fritillaria* (the crown-imperial), which becomes violet.

MECHANICAL INVENTIONS.

Mr. George W. Greene, corner 41st street and A. V. R. R., Pittsburg, Pa., has patented an improved machine for cutting tapered cork. This ingenious machine cannot be described without engravings.

A means by which the felly of a carriage, wagon, or other similar wheel may be enlarged for the purpose of tightening the tire of the wheel, has been patented by Mr. William Downham, of St. Johns, Mich.

A velocipede designed to be operated by two persons standing and applying their whole weight to the treadles, has been patented by Mr. Oliver U. Guinand, of Lawrenceburg, Ky. This vehicle is more easy to mount than the velocipedes in common use, and affords conveniences for carrying small parcels and packages.

An improved motive power has been patented by Mr. Obadiah W. Gibson, of Kellyville, Texas. This invention relates to improvements in motive powers by which the entire power of the horse is thrown on the shaft that operates the gear mechanism, which may be applied to the running of cotton gins, grist and flouring mills, and other purposes. The invention consists of an inclined wheel applied to a center shaft that turns in fixed bottom bearings and adjustable top bearings, and transmits the power by a crown wheel and gear wheels and shafts in one or both directions.

Messrs. Charles C. Henderson and Jacob R. Henderson, of Arkadelphia, Ark., have patented a machine adapted for measuring heavy cloths, bagging, and similar materials in lengths, as desired, in place of the usual method of measuring by hand. More particularly the object is to wind the material from the roll upon a suitable drum, measure the material as it is wound, and provide an indicator of the amount rolled off, so that the desired quantity can be wound and then cut off.

A simple machine for rapidly peeling vegetables or fruits, such as potatoes and apples, has been patented by Mr. Hervey Law, of Chatham, N. J. This machine is especially designed for peeling potatoes, which are usually of very irregular forms and sizes; and the invention consists in means whereby the cutter may be quickly set to a longer or shorter travel to correspond to the length of the potato.

An improved cloth-measuring machine has been patented by Messrs. Charles C. Henderson and Jacob B. Henderson, of Arkadelphia, Ark. This improvement relates to machines for winding off and measuring bagging and heavy bolt goods, and is designed to save the time and labor required in doing such work by hand. It is specially calculated to relieve the counting shaft of weight from the passing web.

An improved device for removing fire damp from mines has been patented by Mr. Francis Wodiczka, of Gratz, Austria. The invention consists in arranging a pipe or channel, provided with a series of suction funnels, along the ridge of all the galleries and adits of a mine, which channel is connected with a side channel, which, in turn, leads into the main or receiving channel, which is in communication with the gas flue or chimney.

Hot Water for the Heart.

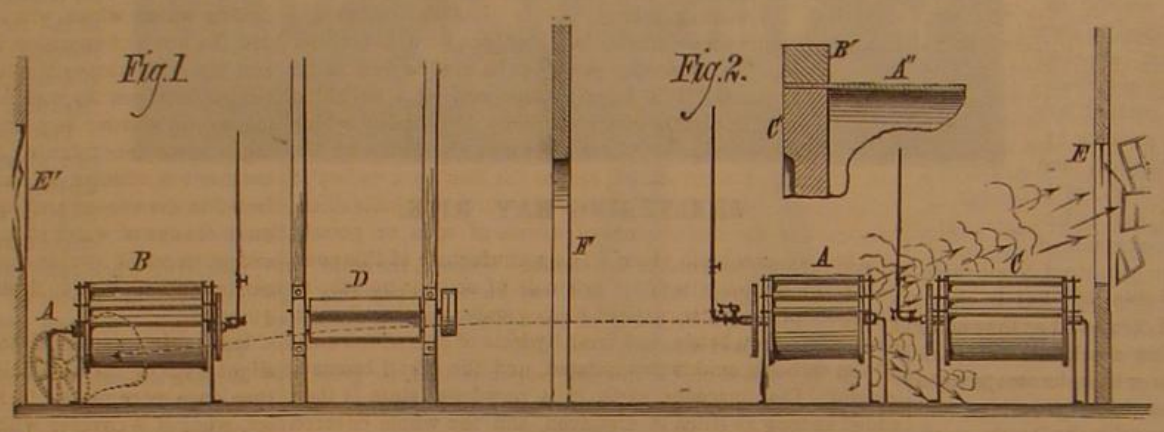
In a letter to the *Lancet*, Dr. A. Paggi records the following observation: He states that in Paris he saw a case in which, under the inhalation of chloroform, the heart ceased to beat, and artificial respiration for ten minutes failed to restore circulation, when Dr. Labbé dipped a large cloth in boiling water and applied it to the region of the heart, with the result of immediately restoring the action of that organ.

THE London *Iron Trade Exchange*, of recent date, publishes a complete list of blast furnaces in and out of blast in the United Kingdom. From the returns it appears that out of the total 943 furnaces built, 563 are in blast and 380 are standing. There are probably 40 furnaces in various districts which are not included in the returns, but none of these have been in blast for many years, and they will never be relighted; others are dismantled, and some have never been completed. The returns from Derbyshire were imperfect, and the figures relating to that district may not be quite accurate, but as regards other districts, the figures, says the *Exchange*, may be relied on.

EXPLOSION OF A STEAM DRYING CYLINDER.

BY S. N. HARTWELL.

On the afternoon of July 10 a steam drying cylinder in the Staten Island dye house of Barrett & Nephews, about one mile south of the steamboat landing at Port Richmond, S. I., exploded, seriously injuring five persons. The sketch, Fig. 1, shows the cylinder at A, one of three driven by a small steam engine and used for drying piece goods. Fig. 2 is an enlarged detail of the head joint. The cylinder was made of copper, tinned on its exterior surface, 36 inches diameter by 48 inches long. The copper shell was about one-tenth of an inch thick, brazed at its longitudinal seam and fixed upon a cast iron spool by means of wrought iron hoops shrunk upon the copper over the spoolhead shown in section, Fig. 2, in which B′ is the hoop, C′ the cast iron head, and A″ a section of the copper. The copper was calked at the edge, between the hoop and head, to make it steam tight, and to support the head. The heads were flat, something less than three-quarters of an inch thick in the web, thickened at the periphery, as shown in Fig. 2. The barrel of the cast iron spool was hollow, having hollow wrought journals. The inlet and outlet pipes for the steam were half inch, and entered the journals through stuffing boxes. A small safety valve was fixed to the inlet pipe. This cylinder is said to have borne a test pressure of 100 pounds to the square inch, applied by the makers. This, however, may be an error. The cylinder was about three years old, but had lately been to the maker to be retinned, since when no one remembers to have seen steam escape from the safety



EXPLOSION OF A STEAM DRYING CYLINDER.

valve, although the weight was set for a light pressure. The cylinder was located with reference to its fellows at A, and about 150 feet from the steam boiler that supplied it with steam through a 1½ inch main and a half inch branch pipe.

The safety valves on the steam boilers, of which there were four horizontal tubulars in this system, were weighted to blow at a limit of 50 pounds per square inch.

A small drip pipe was tapped into the barrel of the spool of the exploded cylinder at a right angle to its axis; that was for the purpose of carrying off the water of condensation, which was forced out intermittently as the end of the pipe dipped into the water in the bottom of the cylinder at each revolution, steam escaping in the interim. There was a valve opening inward to prevent collapse in case of an accidental vacuum in the cylinder.

On the day of the accident the cylinder, A, had been a short time in operation after standing for considerable time, when the right-hand head blew out as shown, knocking the cylinder, C, against the wall and breaking the frame. The exploded cylinder flew in a direct line of its axis to the left through an open archway, F, into an adjoining room, knocking down and breaking in pieces the squeezing machine, D, and its supporting posts; thence it struck and displaced the third drying cylinder, B, and landed in the corner, at A′, a badly smashed concern, about 40 feet from its starting point. The concussion broke two windows, E and E′, one in each room nearly in line, while a piece of the broken squeezer, D, was shot endwise through the window, E′, into the dye house, breaking a man's arm.

During the experience of Captain C. W. Kennedy, the secretary and superintendent of the works, and that of the dyer, Mr. E. Parker, covering the thirty odd years of the existence of the Barrett dye house, drying cylinders have occasionally given out in a mild way, sometimes even leaving their places from the effect of the escaping steam. The absence of water, which no doubt was present in considerable quantity in this case, accounts for the difference.

THE HYPOTHESIS

in this case is that the safety valve had been damaged in the resetting or the removal of the cylinder for retinning, and that the outlet pipe for steam and water subsequently became choked with a wad of some kind that found its way into the cylinder while repairs were going on. Water accumulated from condensation of steam, which leaked into the cylinder while stopped, and on starting, the pressure in the generator being 40 to 50 pounds per square inch, gradually rose in the cylinder till its strength was exceeded, when it gave way as steam boilers sometimes do at the weakest point. The work of destruction is then accomplished by the explosion—sudden expansion—of the water which is suddenly relieved, the heat due to the difference of pressure escaping from every part of its mass with great violence.

PROTECTION FROM LIGHTNING.

During the present summer thus far no very remarkable damages from lightning in this part of the country have been reported. A few buildings have been struck and a few persons killed; but on the whole the losses of life and property have, we believe, been less than for some years past.

The oil regions of Pennsylvania have been remarkably exempt. Last season, as will be remembered, many oil tanks were struck and their contents burned. But this year, up to the present time, we hear of no oil burning from lightning. We believe that in quite a number of cases the owners of tanks have put up rods and earth connections, with the hope of saving their property. We should be glad if our correspondents in the oil country would send us notes of such improvements and take pains to observe and report the results if thunderstorms take place.

On the 12th of July a heavy thunderstorm passed over the cities of New York and Brooklyn with frequent and powerful discharges of lightning. The thousands of telegraph and telephone wires caused a general diffusion of the electric currents about town. In the SCIENTIFIC AMERICAN office there was a good deal of electrical snapping on the telephone conductors; while at the general Telephone Exchange and also at the Western Union Telegraph office there was an extensive display of this sort of fireworks. At all these offices the wire terminals are located in close proximity to conductors that are well grounded in the earth, and when lightning follows the wires into the buildings it simply leaps, with a spark and snap, to the ground conductor and is dispersed. During the above storm the great seaside resort, near New York, known as the Manhattan Beach Hotel, situated at the edge of the ocean, Coney Island, was struck by lightning; fortunately no serious damage was done. Several thousand persons had sought shelter from the rain within the saloons and under the piazzas of the immense structure. A blinding flash and a deafening roar informed the multitude that the house had been struck. But none were injured. The building is 600 feet long, 100 feet broad, three stories high, and although well provided with almost every other convenience and apparatus for safety, no precautions in respect to protection from lightning had been adopted. The several spires or steeples that rise from different parts of the building were surmounted by ornamental sprays or branches of iron, which would have formed excellent lightning rods had they been connected with the earth. After the storm we made a careful examination of the premises, and found that the lightning had struck the iron ornaments of the central tower, ran down the iron staff thereof on to the wooden timbers within the spire, where the iron terminated; thence the electrical current continued down on the wooden rafters, splintering the same for a distance of about 30 feet to the ceiling of the topmost sleeping room, where it burst through the plastering and took to an adjacent gas pipe, on which the current went to the ground without further damage. It is obvious that all the iron work of the spires and roof trimmings should be connected by rods with the metal pipings in the ground, and doubtless this will now be done. The escape of the tower from fire, with the iron staff terminating in the middle of a mass of dry timbers, is quite fortunate.

We will here repeat the golden rule which must be observed if protection from lightning is expected, namely, *the rod must have a large area of conducting material for its underground terminal*. Everybody will understand the folly of embedding the extremity of the rod in the woodwork of a steeple, as in the foregoing example. But the majority of rods are not much better arranged, as the common practice is to stick the terminals of the rods two or three feet down into dry earth and call the job complete and safe. But the truth is, it is very unsafe; it is not a sufficient electrical earth connection. The extremity of the rod should be joined underground by soldered joints to the metallic water pipes, gas pipes, or drain pipes; in the absence of these metals then long trenches should be made, in which conducting material should be placed, such as a continuous layer, a few inches deep, of iron ore or coal dust—hard coal or charcoal—and the rod should be extended along the trench, in contact with the coal, which is a good conductor.

A Large Monolith.

At a granite quarry in Westerly, Rhode Island, there was recently detached a monolith 150 feet long, 10 feet wide, and 8 feet thick, weighing over 1,000 tons. These dimensions greatly exceed those of the Obelisk of Semiramis, the largest of the Egyptian monoliths. The Westerly stone, a proprietor, Mr. H. Q. French, says, was loosened by one oblong blast-hole in such a simple and perfect manner that the theories and conjectures advanced by many as to the methods of the Egyptians appear absurd. It contains over 12,000 cubic feet of granite, which, cut into smaller blocks, will fetch about $30,000. Mr. French is quite positive that it could be brought to this city, finished as an obelisk, and erected for about $150,000.

Diatoms.

Henry G. Hanks, State Mineralogist, Cal., writes as follows to the *Mining and Scientific Press:*

A diatom is generally admitted to be a single celled plant, bearing a singular relation to the animal and even to the mineral kingdom, being considered by some to belong partly to the latter, and regarded as a vegetable crystal, differing only from minerals in having the power of locomotion, and of multiplying by separation. Kutzing says: "In comparing the arguments which indicate the vegetable nature of the diatomaceæ with those which favor their animal nature, we are, of necessity, led to the latter opinion."

In connection with the idea that the diatoms pertain somewhat to the mineral as well as the animal kingdom, it is a curious fact that silica deposited from fluoride of silicon, if crushed between plates of glass and examined microscopically, with a medium power, markings may be seen on the outer surfaces of the vesicles which resemble those of the diatoms, specially pleurosigma and coscinodiscus. It is also remarkable that Dr. James Blake collected fifty species of living diatoms from a hot spring in Pueblo Valley, Nevada, the temperature of which was 163° Fah. Flint probably originates from diatoms, as does also the silica in certain rocks.

The name *diatom* is derived from a Greek word signifying *being cut in two.* Diatoms resemble the desmids, but differ in having an outer skeleton, or frustule, of silica. The frustule of a diatom is a silicious box, always in two parts, one slipping over the other like a pill box or with edges apposed.

The thickness of a single diatom is, roughly, the sixth that of a human hair, and its weight is estimated at the 187-1,000,000th part of a grain. Some varieties attach themselves to other bodies, as the algæ, while others swim in the water free.

The study of the diatomaceæ, aside from their scientific interest, is very fascinating. Their extreme and varied beauty is a source of constant pleasure to the microscopist, and the question is often asked, Why is so much beauty veiled from human sight?

THE BEAUTY OF THE DIATOMS

consists in their color, their general form, and sculpture, or natural markings, which characterize nearly all of them. These delicate markings are seen under the microscope to be processes, knobs, bosses, concavities, ribs, groovings, and lines, so minute that the highest powers made by the most skillful opticians are required to see them at all; even then they can only be seen when the apparatus is manipulated by the most skillful operators. The lines of certain diatoms have been measured, and are used to test the magnifying and penetrating powers of object glasses. A slide called a test plate has been prepared on which twenty well known species are mounted, commencing with one on which the lines are comparatively coarse, and ending with one—*Amphipleura pellucida*—which has 130,000 lines to the linear inch. For the convenience of study typical diatoms are mounted on a single glass slide, so arranged that reference can be made to a printed catalogue for the names, while in some cases the names of the species are microphotographed on the slide.

The diatoms are placed on the plate by the aid of an ingenious device called a *mechanical finger,* by means of which the shells can be picked up singly and given the desired position. *Moller's Typenplatte No.* 1 has twenty-four lines in each of four groups, comprising about 500 individuals of 395 distinct species and 17 genera. The cost, with printed catalogue, is forty dollars.

Some microscopists are so fond of the study of these minute forms that they scarcely do any other work than to observe, collect, classify, and describe them.

When it is stated that the names of more than 4,000 distinct species of diatoms are given in a catalogue published by Frederic Habirshaw, of New York, each of which has some feature by which it may be distinguished, that this vast kingdom, so to speak, is invisible to the human eye, or nearly so, that when highly magnified many of the species are extremely beautiful, and all of them interesting, it is easy to understand why so much interest is taken in them the wide world over, and why every new discovery is heralded, and calls for samples come from the whole scientific world.

It is an established fact, strange as it may seem, that some of the greatest mountain chains, such as the Andes, and the very soil beneath our feet, are chiefly composed of the

REMAINS OF ANIMALCULES,

invisible to the eye; that is to say, the matter has been used by animated beings, and returned again to the mineral kingdom, retaining the form which it assumed while a part of their minute bodies. Byron has written with more truth than he probably realized that "The dust we tread upon was once alive," and the remark of Dr. Buckland is often quoted: "The remains of these minute animals have added more to the mass of minerals which compose the exterior crust of the globe than the bones of the elephants, hippopotami, and whales."

In the tertiary age beds of diatomaceous or infusorial earth were deposited, consisting almost wholly of these microscopic organisms. The extent of some of these deposits is almost incredible, and is regarded as an evidence of the great age of the world.

The Bohemian deposit in Europe is 14 feet thick, and, by the estimation of Ehrenberg, contains 40,000,000,000 diatoms to the cubic inch.

Darwin observed in Patagonia, along the coast for hundreds of miles in extent, a bed of tertiary sedimentary formation, 800 feet in thickness, overlaid by a stratum of diatomaceous earth. At Bilin, in Austria, a bed of infusorial earth, 14 feet thick, occurs. One merchant sells annually many hundred tons of it. The *Bergmehl,* or mountain meal, of Lapland and Norway, is from beds 30 feet in thickness. It must be remembered that these deposits extend over many thousands of square miles. Notwithstanding the astonishing fact that vast areas of the earth's surface are built of these minute forms, the true nature of these deposits was not known until 1837, when Ehrenberg published his celebrated work on that subject. The same deposition is taking place at the present time. In certain lakes in the United States and elsewhere, deposits several inches in thickness accumulate, composed wholly of the remains of recent diatoms. When thoroughly dried a chalky powder is obtained, which, under the microscope, is easily recognized. Similar deposits have been made known by dredging the bottom of the sea.

According to Professor Joseph Le Conte: In the deeper parts of Lake Tahoe, which sediments do not reach, the ooze is composed wholly of diatoms or infusorial shells.

Dusty showers of a grayish or red color are not unfrequent on the Atlantic and Indian oceans near the coast of Africa. Ehrenberg examined this dust and found it to consist largely of diatoms. He estimated the quantity let fall during a dust shower in the year 1846, near Lyons, at 720,000 pounds, one-eighth of which was diatomaceous, or 90,000 pounds, equal to 45 tons. Diatomaceous earth may be distinguished from other formations of a similar appearance by its insolubility in acids, extreme lightness, power of absorbing liquids, and property of polishing metals. It is instantly recognized under the microscope in the hands of one who is familiar with its use. Diatomaceous earth has its uses as well as its scientific interest. It is largely consumed as a polishing powder under the name of tripoli, from the locality which first gave it to commerce. It is known in California by the absurd name of *electro-silicon,* and at the East by a variety of trade names. It is a very convenient source of soluble silica, employed in the manufacture of silicate of soda or potash, also known as soluble glass. The manufacture of this compound is simplicity itself. Carbonate of soda or potash, as the case may be, is dissolved in boiling water to saturation, in a capacious iron kettle, and fresh hydrate of lime added until all the carbonic acid is precipitated, and the alkali becomes caustic. Diatomaceous earth in a powdered state is then added as long as silica is dissolved, and the whole covered and allowed to cool. When the insoluble matters have settled the clear liquid is drawn off and evaporated in a clean vessel to the required density.

Diatomaceous earth is also used in the manufacture of porcelain, and it is a constituent of certain cements and artificial stones. At one time it was claimed to be a fertilizer, but this is thought to be a fallacy, although Ehrenberg states that the fertilizing power of the Nile mud is furnished by fossil infusoria.

Slabs of diatomaceous earth absorb liquids with avidity, and are used in laboratories for drying crystals and filters. This property might be more generally utilized if better known.

A convenient contrivance for lighting fires is a lump of diatomaceous earth with a handle of stout iron wire. It is dipped into a vessel of petroleum, placed in the stove or fireplace, and lighted with a match. It continues to burn safely for some time. It can be used again and again. No person, however, should make use of it who has not the common sense to carefully set away the vessel containing the coal oil before lighting the match.

Bricks that float in water are made of diatomaceous earth mixed with one-twentieth part of clay and well burned. The art of making these floating bricks was well known in the time of Pliny, but was afterward lost. It has recently been discovered. In the Italian department of the Paris Exhibition of 1878, these bricks were exhibited, which attracted considerable attention. Floating bricks, made wholly of California material, may be seen in the State Museum.

Kieselghur, or "*flint froth,*" of the Germans, from a deposit in Hanover, is extensively used in the manufacture of dynamite, giant powder, lithofracteur, and other explosives. Diatomaceous earth absorbs from three to four times its weight of nitro-glycerine, with the advantage over other absorbents of retaining the nitro-glycerine under greater pressure. Dynamite contains 27 per cent and lithofracteur 23 per cent of diatomaceous earth.

Before the kieselghur can be used it is subjected to treatment to remove water, all organic matter, and coarse particles. It is first calcined in a succession of furnaces, crushed between rollers, and sifted.

It is claimed that the diatomaceous earths of California are unfit for this purpose, but it is the opinion of the writer that they have not had a fair trial.

Diatomaceous earth is largely used in the manufacture of soap to mechanically increase its detersive power. The Standard Company receive large quantities of it from the southern counties of the State.

Imitation Ground Glass.

A very useful kind of varnish is made known by Léon Vidal, which is excellent for producing imitation of ground glass, and will doubtless be found available for other purposes. The formula is:

Sandarac, 18 parts; mastic, 4 parts; ether, 200 parts; benzol, 80 to 100 parts.

Gelatine Emulsion-Making in Hot Weather.

I have thought it might not be amiss to describe the plan I have been following in making emulsion during the last hot weather we had. In my plate making room the temperature was often at 85°; but, nevertheless, several batches of plates were successfully prepared. The method adopted is very similar to that I described in my little book, "The Practical Working of the Gelatine Process;" but there are one or two alterations in procedure. In the first place I use the formula which was described in last *Journal,* using potassium bromide instead of ammonium. It is as follows: Potassium bromide, 250 grains; Nelson's No. 1 gelatine, 45 grains; water, 1 ounce; strong hydrochloric acid, 2 drops.

This is prepared in the usual way, and warmed up to 120° Fah., and the following added in the usual way: Silver nitrate, 300 grains; water, 3½ ounces.

Finally, this next solution is added: Potassium iodide, 12 grains; water, 1 drachm.

This I mix in a long hock bottle, shaking between each addition. This is transferred to a glass flask and boiled for half an hour, shaking up the emulsion at intervals. This is allowed to cool in the flask for half an hour, when to it is added, with shaking: Nelson's No. 1 gelatine, 120 grains; Coignet's gelatine (new brand), 120 grains; water, 3 ounces.

After soaking and very slightly heating to melt it, about three drops of strong ammonia in half a drachm of water is then stirred in, and the emulsion is poured out into a jam pot, which is immediately placed in iced water, a few lumps of ice floating in it. In half an hour the gelatine will be firmly set. The jam pot is then dipped for a few seconds into boiling water, which will loosen the gelatine from its sides, and the lump of emulsion is transferred into moist canvas, and squeezed through into a jar of iced water (the water having been run through filter paper to get rid of all floating matter), in which a few small lumps of washed ice are floating. After ten minutes the water is changed, and after another ten minutes is changed again, when it is again collected in the canvas and squeezed through into water. One more change of water should be sufficient to free it from all except traces of soluble salts. It is then transferred to the canvas and allowed to drain over a jar half an hour to three-quarters.

It is again transferred to the jam pot and melted, and a slight trace of carbolic acid (or other antiseptic) added, and then once more placed in iced water. In half an hour it is set, when it is covered with alcohol and allowed to ripen for a day; and if the jar be placed in water containing a lump of ice, so much the better. When plates have to be coated, the slab on which the plates have to be set is covered with small lumps of ice for half an hour, and if it be thick it is only very gradually cooled; but, on the other hand, it also only very gradually gets warmed again. During this time the emulsion is melted, six drachms of alcohol added, and filtered.

When the plates are coated (after the slab has been dried from all water) it will be found that the film of emulsion will set in a couple of minutes, and that the slab remains cool enough to enable five or six batches of plates, filling the slab, to be prepared; that is, supposing your slab to hold eight plates, you can coat forty to forty-eight without recooling the slab. I find that the gas of the drying box may be lighted immediately, and the drying of the plates will proceed rapidly and not remelt. If gelatine be once *well set* it requires a high temperature to remelt it; and the more water is evaporated the higher the temperature required. As the current of warmed air passes over the plates the moisture is rapidly absorbed, and hence the drying can be effected with safety.

My excuse for writing this must be the fact that I have had many letters asking how I prepare emulsion in this weather, and I trust that this description may be taken as an answer to them. Doubtless there are other modes which will succeed as well; but I think, for an amateur, this plan will be found to be everything that is required. I would just say, that, supposing by any chance the emulsion appears too thin before coating the plates, 40 grains of Coignet's gelatine may be melted in 3 drachms of water and added to the emulsion, with much stirring, immediately before filtering.—*W. de W. Abney, F.R.S., in Journal of the Photographic Society.*

The Chilcat Meteor.

The State Mining of Bureau California has lately come into possession of the meteorite found among the Alaska Indians by Mr. John Muir. The meteor was seen to fall, it is said, by the father of one of the oldest Indians in Chilcat, over a hundred years ago, and was afterward sought out and carried to his hut in triumph. Through the co-operation of the Northwest Trading Company, the Mining Bureau succeeded in conducting negotiations for its purchase; and for a consideration which seems meager as Esau's mess of pottage in the eyes of scientists, the State of California acquired clear title to the meteor, and it arrived in the city, June 24. This aerolite is exceedingly irregular in shape, and the projecting points are as bright as if they had been burnished. A succession of nut-shaped hollows, which cover almost the entire surface, give it an exceedingly curious aspect, and its fantastic contour looks almost as if it had been moulded by some unknown power into the shape of the head of a strange beast. It weighs a hundred pounds or upward, and has been christened, in honor of the locality from which it was procured, "Chilcat Meteor."

A Leech Farm.

In 1841 Mr. H. Witte established a small leech farm in Kent Avenue, Williamsburg, L. I. In course of time this small establishment was abandoned, and one of thirteen acres was established near Newtown, L. I., and to him the writer is indebted for the following information and description of the only leech farm in America. The breeding ponds consist of oblong squares of one and a half acres each. The bottoms of these ponds are of clay, the margins of peat. In June the leeches begin forming their cocoons on the peat margins of the pond.

The greatest enemies to the young leeches are musk rats, water rats, and water shrews, who dig the cocoons out of the soft peat breeding margins. Next to rats and shrews is overheating of the peat or the water of the pond. In fact, nothing is so fatal to leeches as a too high temperature. Mr. Witte tells the *Oil and Drug News* he has had leeches frozen in solid ice, but by slowly dissolving the ice and gradually increasing the temperature of the water the leeches sustained no injury. The depth of the water in the ponds during the summer is three feet; in winter time the depth of water is increased to avoid freezing.

The leeches are fed every six months on fresh blood placed in thin linen bags, which are suspended in the water. The leeches, as soon as they smell the blood, assemble from all parts of the pond, and attaching themselves to the outside of the bag, suck the dissolving coagulated blood through the linen. Digestion proceeds very slowly with the leech, during which time the blood remaining undigested in the stomach of the leech is in a fluid state, as if just taken in. The excremental deposits are of a grass-green color. The best substance for packing leeches in is the peat of their natural ponds made into a stiff mud. Water containing tannin, tannic acid, lime, salt, or brackish water, must be guarded against always; iron is not objectionable, but is an advantage in small quantities.

The demand for leeches in the last few years has somewhat fallen off in the Eastern and Southern States. The Western States and California are now the heaviest buyers. Mr. Witte's sales alone average a thousand a day. The number of leeches imported into the United States amounts to about thirty thousand yearly.

The custom of stripping and salting leeches, to cause them to disgorge after having been applied, has passed away, as many well established cases have occurred of infectious diseases having been communicated on the application of the same leech to a second party. A very popular error exists that a leech when applied takes only the bad blood (whatever that may be) and rejects the good; this is a mistake. With a leech blood is blood, be it the cold blood of a fish or the warm blood of a human being, no matter how diseased that human being may be. So long as blood is not tainted or putrid the leech will thrive on it. A friend of mine, who was the proprietor of a large leech-breeding establishment at the foot of the Hartz Mountains, when wishing to feed his leeches, was in the habit of hiring poor laborers, at six cents per day, to stand in the water for half an hour nearly up to their thighs, that the leeches might obtain a full gorging of human blood.

In the marshy lands of Roumania the wild leeches are captured by means of men entering the water and allowing the wild leeches to fasten on to their naked bodies. The leech fishers then strip them off after reaching the shore.

[If it is dangerous to apply the leeches a second time the druggists should beware of the Hartz leeches. And the question may be asked whether the blood feeding practiced at Newton may not also produce poisonous leeches.]

Dangers of Sulphuric Acid.

A driver named Sellers lately lost his life at Leeds, England, by the upsetting of a wherry or cart loaded with sulphuric acid. A witness testified that the horse was going at a good pace, and the deceased was unable to pull up, and therefore the deceased turned into a lane, but a wheel coming into contact with a stone the wherry upset, and Sellers fell into the road with fifteen carboys of vitriol, many of them broken, on the top of and around him. When the witness got up he could see nothing of the driver, but, after some moments, discovered that he was lying under four broken carboys. He got assistance, and a quantity of water and milk was thrown over the deceased, whose clothing was being consumed and flesh eaten away by the liquid. He was taken up and carried in an insensible state to a farmhouse near. The skin and muscles of his left upper arm, near the shoulder, had been destroyed for some distance, laying bare the bone. The left foot and ankle were similarly destroyed, as were also several other parts of his body. Shock to the systen caused by the extensive destruction of tissue was the cause of death two hours after the accident.

The coroner, in addressing the jury, said the case seemed to be one of accidental death. It was dangerous for a man to ride on his wherry, as the deceased had done, with such a load behind him; but, of course, he would not expect any accident to happen. Seeing what had been the result of the accident, happening where it did, it was a matter for consideration as to what the consequences would be were such a terrible affair to occur in a crowded thoroughfare, passing through which these wherries of carboys were every day. He had seen the carboys packed in three tiers with only a rope put loosely round them, and should an accident happen the chemical might run down the causeway and produce frightful results to foot passengers. It was a question for the authorities of the town as to whether this mode of conveying vitriol was a proper one. The jury returned a verdict of "accidental death."

The Prevention of Fouling in Iron Ships.

The prevention of fouling in the hulls of iron ships is a matter that has long engaged the attention of those interested in the construction and equipment of iron vessels. Many methods have been tried in order to protect vessels against the growth of barnacles in tropical waters, but it can scarcely be said that any of these have proved entirely successful. At present, ships require to be periodically docked and cleaned, and this entails not only a loss of time, but considerable expense. Much interest is, therefore, taken in a new ship which was launched from the shipbuilding yard of Messrs. T. B. Seath & Co., Rutherglen. This vessel, which is named the Bessie, is built from designs by Mr. G. L. Watson, naval architect, for Mr. John Clarke, Paisley, and is intended as a tender for the yacht Condor.

The novelty about the Bessie is that it is covered over the hull, to six inches above the water line, with a plate of zinc, and by means of this it is believed that the vessel will be thoroughly proof against fouling. The thickness of zinc employed is not great, and it is fitted so closely as not to interfere in the slightest with the delicate outlines of the vessel, but its thickness is sufficient to last, it is calculated, for fully six years. The patentees of this system are Mr. J. Jepson Atkinson, barrister, and Mr. C. F. Henwood, naval architect, of the Middle Temple, London.

The well known action of iron on zinc in salt water led to the discovery of this invention; but while the use of zinc was well known, the difficulty of attaching it to the hulls of ships remained. Mr. Atkinson and Mr. Henwood have completely overcome this difficulty, and there can be no doubt that the use of their system will be watched with much interest by the shipping community. The method employed in fixing the zinc is simple and effective. The zinc sheets are attached to the iron plating of the vessel at spots nine to twelve inches apart, and at these spots a mechanical joint is made by an alloy or solder, the surface of the spots being about an inch and a half square. The method of attachment causes the zinc to act like copper on the bottom of a wooden ship. Zinc in the ordinary seaway coming in contact with iron oxidizes to the extent of about two to three ounces per square foot in a year, but by attaching zinc of sufficient thickness the vessel can be kept at sea for several years without docking, cleaning, or painting. Scraping will not be required, and the speed of the ship will not be diminished by the growth of barnacles. Mr. H. N. Moseley, of the University of London, has expressed himself satisfied with the chemical action of the new process, and there can be no doubt that the invention will, if successful, be of immense importance to shipowners. The career of the vessel will consequently be watched with great interest.—*Marine Engineer.*

Composite Portraits.

At the last meeting of the Photographic Society of Great Britain, Mr. Francis Galton, F.R.S., read a paper on "Composite Portraiture," in which he stated that his attention was first directed to the subject some years ago, when he found that by taking two or more portraits of different individuals under exactly the same conditions, and superimposing them, the features, if not absolutely dissimilar, blended together and formed an idealized portrait which could be well seen when the image was thrown upon a magic-lantern screen. The register he adopted, so that the features should be identically superimposed, was by drawing a horizontal line through the eyes, another parallel to this through the mouth, and a third perpendicular to and bisecting these horizontal lines through the nose. The point of bisection between the eyes was that which he was especially careful to maintain in the same position in each portrait. Mr. Galton's first method of producing composite portraits was by means of a copying camera, paper positives being used. He now, however, used transparencies, and he exhibited and described the apparatus which he had adopted for the purpose. One purpose for which he believed composite portraits would be valuable was that of producing a standard physiognomy of disease With this object he had taken the portraits of a number of consumptive persons, male and female, and had combined them; and it was remarkable how a certain average of faces was found to be almost identical. Mr. Galton also exhibited a number of what he called typical portraits. One was the face of an idealized criminal, formed from a combination of seven portraits of criminals, others were the faces of consumptive patients, and a third series was that of the portraits of officers and men of the Royal Engineers. In one case he had combined the portraits of twelve officers, in another the portraits of eleven privates, and in a third he had combined the portraits of officers and privates. In each instance Mr. Galton said the individualty marking each class was strongly brought out and idealized. He also pointed out how, in every case, the idealized portrait was better looking than the faces from which it was made.

In conclusion, Mr. Galton referred to the use which photographers might make of composite portraits. He thought the process could be turned to a most interesting account in the production of family likenesses. Artistic excellence was of no consequence in the negatives, and all that was necessary was that the portraits should be taken under the same aspect, either as a perfect profile or a perfect full face, and under the same conditions of light and shade. The result of the combination of a number of faces of the same family was often very curious, not the least singular point being the circumstance that there was often a difference of opinion as to whom the idealized portrait was most like. Mr. Warnerke said, that when Mr. Galton first described his method, some years ago, he had tried the production of composite portraits, and found the result exceedingly interesting. Captain Abney expressed surprise at the result of an experiment which Mr. Galton had made to show that repeated exposures on the same plate made no difference in the result. Had not Mr. Galton proved that he was right, he should have expected some difference. After a remark from Col. Wortley, Mr. Galton observed that one curious result he had noticed was in the case of a combination portrait of two criminal boys. This portrait was given to an artist to copy, and, singularly enough, although the artist had never seen either of the boys, the picture he drew was a portrait of one of them rather than a copy of the composite.

RECENT INVENTIONS.

A table especially designed for convenience in writing on large heavy books, such as books of record that are used in registers' and other public offices, has been patented by Mr. John A. Harriman, of Bellaire, Mich.

An apparatus for preparing wheat for grinding has been patented by Mr. James Willard Smith, of New York city. The object of this invention is to remove the dust, fuzz, and other impurities from the creases in the kernels of the wheat, and also to prevent the bran from being pulverized and mixed with the flour.

An improved vehicle specially adapted to the use and amusement of children, which shall serve either as a wheeled carriage or as a swing, its construction insuring the comfort and safety of the occupant, has been patented by Mr. Mason Remley, of Hamden Junction, O.

An improved lye-trough for soap-makers, patented by Mr. Daniel F. Trout, of Feesburg, O., consists of a trough or pan made of metal or wood, with a spout at one side or end, which is on a level with the bottom of the trough or pan.

In most of the so-called "magic" pen and pencil cases the pen cannot be pushed out for use unless the pencil is also out; hence, in using the pen the pencil is apt to become inked and its point or lead thereby injured. Mr. Richard M. Collard, of New York city, has patented a pen and pencil case in which this defect is remedied, by so constructing the case that the pencil can be attached to or detached from the "magic movement" at the will of the user, so that the pencil-point will not be out while using the pen, though the case be drawn out to its full length.

An improved ice cream freezer has been patented by Mr. John Marsden, of Chester, Pa. The object of this invention is to furnish ice cream freezers so constructed that they will make smoother cream than the ordinary freezers, and will make a greater quantity of cream from the same quantity of material.

A Phosphorus Microphone.

In his photophonic experiments, Professor James Blyth, of Edinburgh, was led to construct a useful form of selenium cell by dovetailing two brass combs, having alternate teeth knocked out, and filling up the spaces between the interlocking teeth with the selenium. A modification of this pattern is made by fastening a brass disk on wood, and sawing it across until it consists of radial sectors, which are afterwards connected by selenium. While trying to use amorphous phosphorus in place of the latter substance he found the phosphorus evolved a current which varied with the pressure on the phosphorus, and the idea occurred to him that a microphone could be made from it, which would not generate its own electricity. He therefore took a shallow wooden box having a brass bottom, and spread a layer of phosphorus upon it, a thin flexible brass lid covering the box and touching the phosphorus. Wires from a telephone were then connected to the metal top and bottom of the box, and on speaking into a mouthpiece directed to the thin brass cover, the words were distinctly reproduced. The varying pressure of the sound waves on the phosphorus established an undulating current, which, passing through the telephone, caused it to give out the original words. When a battery was included in the circuit the sounds were remarkably clear and loud and free from the grating which disturbs the carbon microphone. Professor Blyth also finds that the cell, which is really a form of loose contact, operates as a receiver as well as a transmitter, and will of itself emit articulate sounds under the influence of the vocal current.

Silicon in Steel Rails.

Dr. Dudley's formula for the composition of steel rails allows 0·04 per cent of silicon, but other experiments show that ten times that amount of silicon can be admitted, and still retain an excellent physical character. The allowance of this margin is fortunate, because of the inability of determining when silicon is removed, as can be so exactly determined in the case of carbon.

Out of 35,000 rails on Swedish state railways, only 4 broke in the winter of 1880, under a composition of 0·20 to 0·30 carbon, and 0·1 to 0·3 silicon. The diverse views held by different experts, and various conclusions arrived at, show that much yet remains to be determined by experiment, before the best composition for a steel rail can be offered.—*North American Manufacturer, July 14.*

Business and Personal.

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

Inventors can exhibit Models free of charge at Bunnell's Museum, Broadway corner 9th St., New York. Excellent opportunity to interest capitalists, as the best class patronize the institution.

Ball's Variable Cut-off Engine. See adv., page 76.

Baxter Wrenches fit peculiar corners. Indispensable to first-class mechanics. Greene, Tweed & Co., N. Y.

An experienced and competent Engineer wants a situation. Address R. M. Lodge, 25 S. Del. Ave., Phila., Pa.

The best tonic we know of is Van Beil's "Rye and Rock." Try it.

Party owning Sash, Door, and Blind Factory, wishes to add to his manufacture some Specialty (a good patent preferred), which will meet with large and profitable sales. Address X. Y. Z., Box 672, New York city.

C. Heinen's Wagon Spring, illustrated in SCIENTIFIC AMERICAN, July 9, 1881, p. 19. U. S. Patent is for sale, or will license to manufacture on royalty. Address Christopher Heinen, Fort Laramie, Wyoming Territory.

R. J. W.—Froth or scum in your boilers caused by sediment in water from driven wells, entirely obviated without loss of water, by Hotchkiss' Mechanical Boiler Cleaner. Send for circular. 84 John St., New York.

Linen hose, rubber hose, cotton, rubber, and leather belting. Greene, Tweed & Co., 118 Chambers St., N. Y.

Agricultural Engines for sale cheap by S. J. Benedict, East Randolph, N. Y.

For Sale.—A complete set, except for year 1870, of U. S. Patent Office Reports, from 1847 to 1871, inclusive; also Official Gazette of U. S. Patent Office from 1872 to 1877 inclusive. Address P. O. Box 2367, New York.

Wanted—Good Boiler Floats. Box 498, Bellevue, Ohio

The Common Sense Dry Kiln prevents check, warp, or hardened surface. See St. Albans M'f'g Co.'s adv. p. 60.

For Sale.—Turret Lathe, with Chaser Bar. No. 1 and 4 Root Blowers. B. & W., 261 N. 3d St., Phila., Pa.

Tarred Roof'g, Sheath'g Felts. Wiskeman, Paterson, N. J.

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

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

List 26.—Description of 2,500 new and second-hand Machines, now ready for distribution. Send stamp for the same. S. C. Forsaith & Co., Manchester, N. H.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Punching Presses & Shears for Metal-workers, Power Drill Presses $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N. Y.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers Philadelphia. Correspondence solicited.

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

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Cope & Maxwell M'f'g Co.'s Pump adv., page 45.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

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

The Sweetland Chuck. See illus. adv., p. 46.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N. Y.

Clark Rubber Wheels adv. See page 28.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

For best Duplex Injector, see Jenks' adv., p. 60.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

4 to 40 H. P. Steam Engines. See adv. p. 61.

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

Skinner's Chuck. Universal, and Eccentric. See p. 46.

Improved Skinner Portable Engines. Erie, Pa.

Peck's Patent Drop Press. See adv., page 76.

For the best Diamond Drill Machines, address M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

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

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

Turbine Wheels; Mill Mach'y. O. J. Bollinger, York, Pa.

Brass & Copper in sheets, wire & blanks. See ad. p. 75.

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

Clark & Heald Machine Co. See adv., p. 78.

Wren's Patent Grate Bar. See adv. page 77.

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

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 78.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. B. Dudgeon, 24 Columbia St., New York.

Eagle Anvils, 10 cents per pound. Fully warranted.

Geiser's Patent Grain Thrasher, Peerless, Portable, and Traction Engine. Geiser M'f'g Co., Waynesboro, Pa.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 78.

Houston's Four-Sided Moulder. See adv., page 76.

Houghton's Boiler Compound contains nothing that can injure the iron, but it will remove scale and prevent its formation. Houghton & Co., 15 Hudson St., N. Y.

Long & Allstatter Co.'s Power Punch. See adv., p. 77.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 77.

For Mining Mach'y, see ad. of Noble & Hall, p. 76.

New Economizer Portable Engine. See illus. adv. p. 76.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Combined Concentric and Eccentric Universal and Independent Jaw Chucks. The Pratt & Whitney Co., Hartford, Conn.

The I. B. Davis Patent Feed Pump. See adv., p. 77.

Rue's New "Little Giant" Injector is much praised for its capacity, reliability, and long use without repairs. Rue Manufacturing Co., Philadelphia, Pa.

Rowland's Vertical Engine. Wearing parts of steel. Broad bearings. F. C. & A. E. Rowland, New Haven, Conn.

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

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

Saw Mill Machinery. Stearns Mfg. Co. See p. 78.

Wiley & Russell M'f'g Co. See adv., p. 45.

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

Use the Vacuum Oils. The best car, lubricating, engine, and cylinder oils made. Address Vacuum Oil Co., No. 3 Rochester Savings Bank, Rochester, N. Y.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

(1) H. K. asks what is the velocity of steam through a six inch pipe open at the end, at a pressure of 20 lb., 60 lb., and 100 lb. A. 20 lb. above atmosphere, 1,413 feet velocity per second; 60 lb. above atmosphere, 1,447 feet velocity per second; 100 lb. above atmosphere, 1,464 feet velocity per second.

(2) E. G. asks at what age German carp, under favorable circumstances, spawn. A. Under favorable conditions, the second year.

(3) B. & P. ask for a receipt for making carmine ink, such as is used with rubber hand stamps. A. Dissolve a sufficient quantity of good fuchsine (aniline red) by trituration in warm glycerine. See inks, in SUPPLEMENT, No. 157.

(4) G. S. H. asks: What will remove smoke stains from ivory? I have a valuable set of chessmen which have passed though a fire and were smoked badly. A. Immerse the pieces in benzine, and go over them with a brush. We know of nothing that will dissolve the sooty matter.

(5) A. J. asks: Can the dark part of the moon be photographed? A. Mr. Janssen has succeeded in photographing the lumière cendrée, or "earthshine" on the moon when three days old. In the photograph the "continents" were to be distinguished clearly from the "seas." This disposes of the view sometimes advanced, and held by some eminent astronomers, that the "new moon in the arms of the old" was an optical illusion.

(6) E. M. asks: When and where was the first telegraph used in this country? A. The first telegraph line in this country was established on Long Island, by Harrison A. Dyar. The signals were made by frictional electricity. We can't give exact date.

(7) A. C. and others inquire how to etch on steel. A. The clean plate must be covered with an even film of wax, either applied while the plate is uniformly heated, or dissolved in alcohol and flowed on the warm plate. The etching fluid may be made as follows: Pyroligneous acid, 4 oz.; alcohol, 1 oz.; nitric acid, 1 oz., by measure. Or use iodine, 1 oz.; iron filings, half a drachm; water, 4 oz. The lines are cut through the wax with a fine steel point, so as to leave the metal surface bare under the lines. The etching fluid is then poured on, and removed as soon as the metal is sufficiently etched.

(8) L. T. asks for a simple process for extracting oils from herbs. A. The volatile oils are generally obtained by distilling in a deep narrow retort the articles along with an equal weight of water; but some substances that give out their oil with difficulty are first soaked for twenty-four hours in twice their weight of water, to each gallon of which 1 lb. of common salt has been added, by which its boiling point is raised, and consequently the oil comes over more readily. The distillate separates into two layers, the water being drawn off and returned to the retort, and this is repeated until distilled water ceases to come over mixed with oil. The rectification of the oil is performed without water, by the careful application of heat just sufficient to cause them to flow over pretty rapidly, so that they may be kept heated for as short a time as possible.

(9) H. R. asks how to make a strong paste that will not sour. A. Try the following: Four parts by weight of glue are allowed to soften in 15 parts of cold water for some hours, and then moderately heated till the solution becomes quite clear; 65 parts of boiling water are now added with stirring. In another vessel 30 parts of starch paste are stirred up with 20 parts of cold water, so that a thin milky fluid without lumps is obtained. Into this the boiling glue solution is poured, with constant stirring, and the whole is kept at the boiling temperature. After cooling, 10 drops of carbolic acid are added to the paste. The paste must be preserved in closed bottles to prevent evaporation of the water, and will in this way keep good for years.

(10) D. W. S. asks how to make and apply a good aquarium cement. A. A good cement is composed of 3 oz. of linseed oil, 4 oz. of tar, and 1 lb. of resin. These are allowed to melt together over a gentle fire. If too much oil is used, the cement will run down the angles of the aquarium; to obviate this, it should be tested before using by allowing a small quantity to cool under cold water, and if not found sufficiently firm, allowing to simmer longer, or have more tar and resin added. The cement should be poured in the angles of the aquarium while in a liquid state, but not when boiling, or it would most assuredly crack the glass. The cement will become firm in a few minutes, and the aquarium may then be tilted up in a different position while a second angle is treated likewise. This composition adheres firmly to the glass, is so pliant that it may be pressed into any shape by the fingers, and it does not communicate any poisonous quality to the water.

(11) W. M. M. writes: 1. I have some glass pickle jars of 12 fluid ounces capacity, inside measure 2¾ diameter by 3¾ deep. I have nine jars, and can get eight more same as these, and I want to make a battery for experimenting electric light, electroplating, etc., and I want to know the best way to fit them up, using carbon and zinc? A. For general experimental purposes a plunging battery is best; for continued use the bichromate battery with a porous cell is best; but your bottles would be too small to admit of the use of a porous cell. See SUPPLEMENTS, Nos. 157, 158, 159, for information in regard to batteries. 2. Is it best to put a zinc between two carbons, or a carbon between two zincs, or one carbon and one zinc, or is some other material better than carbon? A. Use two carbons and one zinc, placing the zinc between the carbons. 3. What solution is best: Smee solution of water and acid, or bichromate of potash? A. Use a bichromate solution and amalgamate the zincs. 4. If all the positives and all the negatives are connected, will it be the same, and give the same power, as if it was all one surface and in one cell? A. Yes. 5. Is it quantity or intensity that is needed to produce light and heat? A. For experiments with limited battery power the elements should be connected for intensity. 6. Can you give a description of a small powerful microphone—one that will repeat ordinary conversation carried on in a room about 30x10x12—and is it necessary to use an induction coil in the circuit of the microphone and receiver, and what kind of receiver can be used with it? A. Use the Blake transmitter and the Bell receiver. An induction coil is essential.

(12) C. H. B. asks how to prepare the mixture used in the storm glasses sold on the streets. A. The mixture is made as follows: Place in a long narrow bottle or test tube, camphor gum, 2½ drachms; spirits of wine, 11 drachms. When the camphor is dissolved add the following mixture: water, 9 drachms; saltpeter, 38 grains; sal ammoniac, 38 grains. Dissolve these salts in 9 drachms of water before mixing with the camphorated spirits, then shake the whole together. Cork up tight, and seal with wax, then make a small hole through the cork with a red hot needle, so as to have a small clean hole. Heavy atmosphere will cause the salts to rise; a light atmosphere, to fall. Cost of mixture, 10 or 15 cents.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

July 5, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 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. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Alarm. See fire alarm.
Album, E. S. Glover 243,772
Alkali, grinding and sieving caustic, W. J. Menzies 243,939
Alumina, manufacture of sulphate of, B. E. R. Newlands 243,942
Amalgamator, J. Scott 243,802
Axle box, car, J. A. Rapp 243,792
Axle box, car, I. P. Wendell 243,820, 243,821
Axle, carriage, A. E. Smith 243,807
Axle skein, I. E. Ricketts 243,974
Axle truss, wagon, M. W. Jory 243,915
Axle, vehicle, G. Schreyer 243,719
Baby jumper, J. D. Snyder 243,808
Bag machine, W. C. Cross 243,857
Bale tie buckle, H. L. Howe 243,904
Baling case, C. H. Merry 243,940
Ball. See target ball.
Band cutter and scatterer, H. A. Shaw 243,804
Basin, wash, C. H. Moore 243,718
Beef cattle, process of and apparatus for handling, slaughtering, and dressing, J. H. Sparrow 243,809
Bellows, J. H. F. Hankwitz 243,886
Berth, ship's, S. Shaw 243,983
Bicycle, E. C. F. Otto 243,959
Bit. See bridle bit.
Block. See pulley block.
Bloom, artificial Jamestown, T. O. Townsend 243,816
Board. See electric circuit piano sounding board, switch board.
Boat. See Collapsible boat. Torpedo boat.
Boiler. See stand boiler.
Bolt heading die, A. Pond 243,967
Book cover shield, E. E. Johnson 243,706
Book, detachably covered, W. L. Deming 243,863
Book holder, L. W. Noyes 243,955
Boot and shoe counters, machine for flanging, Hurlbut & Kennard 243,917
Boot and shoe heel, Brown & Peever 243,845
Boots and shoes, cording and turning machine for, P. Rainaud 243,724
Bottles, packing box for, S. Cary 243,756
Box. See axle box.
Box nailing machine, F. Toepfer 243,997
Brace. See sleigh brace.
Bracelet, G. R. Howe 243,704
Bracelet, C. E. Richards 243,793
Bracelet gauge, W. H. Howes 243,905
Brake. See car brake. Wagon brake.
Bridle bit, J. N. Books 243,684
Broiler, meat, H. W. Libbey 243,714
Broom holder, W. Hill, Jr. 243,898
Bucket bottom, reversible well, W. H. Roe 243,976
Buckle and snap hook, F. L. Clark 243,758
Button, cuff, L. H. Thomas 243,995
Button machine, Z. B. Pierce 243,723
Button polishing machine, T. Guilford 243,702
Cake and fruit stand, revolving, J. C. Koch 243,781
Camera obscura, W. I. Taylor 243,813
Can. See creaming can. Milk can.
Canister. See tea canister.
Cap, H. Neufeld 243,947
Car brake, friction, T. Sprick 243,736
Car coupling, J. E. Ament 243,825
Car coupling, Johnson & Robison 243,707
Car coupling, D. H. Sherman 243,985
Car, iron railway, W. A. Cushman 243,762
Car, railway, A. F. Martel 243,932
Car, stock, M. O'Neal 243,957
Car, stock, J. J. Padden 243,960
Car, street railway, W. Robinson 243,796
Car wheel, J. E. Atwood 243,826
Carriage, P. Dansereau 243,860
Carriage, child's, H. M. Richardson 243,973
Carrier. See egg and fruit carrier.
Case. See baling case. Piano case.
Caster, J. Toler 243,998
Casting stereotype plates, mould for, W. Scott 243,981
Chains and bracelets, manufacture of ornamental, J. H. Totten 243,999
Chains, stock for making ornamental, J. R. & T. W. Feeley 243,786
Chair. See convertible chair. Rocking chair. Opera chair.
Chicken cholera compound, D. Cross 243,693
Chuck, drill, G. S. Rominger 243,978
Chuck, drill, D. Slate 243,806
Churn, J. C. Kile 243,919
Churn lid, W. Dobson 243,865
Cigar end cutter, J. Ochs 243,956
Cigar lighter, B. B. Schneider 243,980
Cigar mould, S. Roman 243,738
Cigarette papers, envelope for, C. G. Emery 243,875
Clamp. See hitch clamp.
Cleaner. See steam boiler cleaner. Wheat cleaner.
Clock spring, E. Horton 243,901
Closet. See water closet.
Clothes washer, E. H. Murray 243,946
Cock, stop, F. Schrumpf 243,731
Coffin, D. R. Johnson 243,913
Collapsible boat, S. W. Wardwell, Jr. 244,009
Convertible chair, S. Williams 244,014
Convertible chair and cot, E. Hatch 243,775
Conveyer, J. S. Leas 244,119
Cooler. See milk cooler.
Cooling rolls, journals, and shafts, W. R. Jones 243,708
Corn from the cob, machine for cutting green, V. Barker 243,829
Corset, C. V. Turner 243,818
Cotton or other press, H. L. Freeman 243,979
Cotton press, revolving, J. M. Shaw 243,982
Coupling. See car coupling. Shaft coupling. Hose coupling.
Creaming can, D. W. Potter 243,969
Crucible for melting metals, J. Pedder 243,788
Crucibles, method of and composition for lining plumbago, J. Pedder 243,789
Cultivator, R. K. Niece 243,951
Cultivator teeth, attaching, C. M. Stevens (r) 9,788
Cup. See oil cup.
Cutter. See hand cutter. Cigar end cutter.
Decoy duck, L. H. North 243,954
Dental plates, etc., apparatus for forming, R. J. Victor 243,819
Die. See bolt heading die.
Digesting, evaporating, and refrigerating apparatus, E. Fox 243,769
Disinfecting and automatic flush tank, J. J. Powers 243,970
Disintegrating machine, A. P. Lipsey 243,928
Doll head, F. Bartenstein 243,752
Doll house, etc., Dorn & Crandall 243,979
Door lock and burglar alarm, combined pocket, J. A. Lee, Sr. 243,926
Drain pipes, testing, F. Tudor 243,741
Drill. See seed drill.
Drum, stove pipe heating, J. F. Weitzel 244,011
Dynamometer, H. C. Hovey 243,902
Edger, W. McDonald 243,717
Egg and fruit carrier, L. H. Page 243,961
Electric circuit switch board, F. Blake 243,839
Electric machine, dynamo, J. J. Wood 243,746
Electric wires, conducting, W. M. Conway 243,843
Electrical armatures, machine for winding, J. Brady 243,844
Electro-magnetic motor, M. G. Farmer 243,769
Elevator. See sucker rod elevator.
Elevator, E. Raber 243,791
Elevator safety attachment, P. Gately 243,771
Engine. See gas engine. Road engine. Pumping engine. Steam and other engines.
Engine, C. L. Work 243,823
Envelope, document, J. W. Wilson (r) 9,792

Evaporating apparatus, Brooks & Le Page..... 243,686
Extractor. See nail extractor.
Fabric. See knit fabric.
Farm gate, C. P. Emery..... 244,018
Farm gate, J. A. Lease..... 243,712
Farm gate, F. M. Smiley..... 243,688
Feathers, composition for cleaning and disinfecting, M. Beer..... 243,754
Fence, J. A. Marine..... 243,93
Fence, A. Todd..... 243,815
Fence, barbed, Bernard & Rice..... 243,855
Fence, flood, T. C. Nichols..... 243,930
Fence, metallic and barbed wire, M. Falcon..... 243,696
Fence, portable, S. M. Coop..... 243,854
Fence wires, machine for barbing, F. L. Bestor... 243,683
Fertilizer distributer, G. N. Joss..... 243,916
Fertilizer distributers, feed cup for, W. Marks.... 243,716
Filter, water, C. L. Ridgway..... 243,975
Fire alarm, T. Shaw..... 243,984
Firearm, A. L. Sweet..... 243,993
Firearm, breech-loading, J. Borden, Jr..... 243,842
Firearm lock, Hewitt & Kimball..... 243,894
Firearm, magazine, A. Schneider..... 243,801
Fire escape, D. S. Thomas..... 243,994
Fire escape, W. Winkless (r)..... 9,790
Fire extinguisher, A. M. Burritt..... 243,817
Fisherman's reel, F. A. Loomis (r)..... 9,785
Fishway, A. B. Hendryx..... 243,893
Fork. See hay fork. Table fork.
Form, adjustable dress, J. Hall..... 243,705
Furnace feeder, I. Erickson..... 243,694
Furnace for the reduction of ores and for the carbonization and decarbonization of iron, S. G. Clark..... 243,851
Furnace for the reduction of zinc, cinnabar, and other ores, S. G. Clark..... 243,850
Gauge. See bracelet gauge.
Game apparatus, A. B. Bullard..... 243,688
Game counters, etc., box for holding, J. H. La Bau 243,925
Gas engine, J. Robson..... 243,795
Gate. See farm gate.
Gate, M. Faloon..... 243,695
Gate, Fisher & Pitcher..... 243,877
Gelatine prepared in the form of dried foam, R. Brooks..... 243,685
Gold and silver ores, apparatus for treating, W. M. Fuller..... 243,699
Gopher trap, A. Norris..... 243,953
Grain meter, C. Wais..... 244,006
Grain scourer, H. A. Barnard..... 243,839
Gratings employed to cover openings to vaults, etc., walking surface of illuminating, T. Hyatt 243,779
Grinding grain, roller mill for, D. F. Brown..... 243,687
Hame, J. W. Hudson..... 243,777
Hame fastener, Gelabert & Steinkuhler..... 243,882
Hammer, trip, S. Shetter..... 243,986
Handle. See tea and coffee pot handle.
Harness tie strap holder, E. A. Blickenstaff..... 243,840
Harrow, T. E. Jefferson..... 243,705
Harvester reel rake, W. H. Knapp..... 243,711
Hat fulling machine, J. Warton..... 243,743
Hats, scalding napped, G. M. Wheeler..... 244,012
Hay and cotton press, M. H. & J. A. McIlryde..... 243,785
Hay fork, horse, P. Beardsley..... 243,682
Header and thrasher, combined, A. H. Lighthall. 243,715
Heater. See sad iron heater.
Heating, cooking, and drying apparatus, combined, S. W. Mansfield..... 243,929
Hitch clamp, J. Mathie..... 244,020
Hog ringing implement, A. L. Hill..... 243,895
Hoisting drum, E. A. Beyer..... 243,837
Holdback for hames, W. B. Hayden..... 243,891
Holder. See book holder. Trace holder. Broom holder.
Holder for grinding tools, Gardner & Woodbridge 243,770
Horn shavings, treating, J. Pathe..... 243,963
Horse rake, J. G. Thomas..... 243,995
Horseshoe nails, machine for forging, C. W. Woodford..... 244,015
Hose coupling, M. Dillmeier..... 243,864
Hose coupling compound, G. Westinghouse, Jr.. 243,822
Hose nozzle, E. Madden..... 243,938
House. See doll house.
Hydrant valve, Z. E. Coffin..... 243,691
Ice cream freezer, Reed & Cumming..... 243,971
Insulated telegraph wires, machine for making, T. J. Mayall..... 243,783
Insulators, compound substance for electric, T. J. Mayall..... 243,782
Interlocking switch and signal mechanism, J. A. Bonnell..... 243,841
Iron and steel, manufacture of ingot, W. Hainsworth..... 243,774
Isinglass, etc., manufacture of, W. N. Le Page.... 243,713
Jack. See sewing and pegging jack.
Knit fabric, J. Nelson..... 243,787
Lactates, manufacture of, C. E. Avery..... 243,827
Lamp, J. F. Krame..... 243,924
Lamp, electrical, L. G. Woolley..... 243,748, 243,749
Lever for lifting jacks, etc., ratchet, J. S. Kirkwood..... 243,922
Line or leader, casting, J. Shields..... 243,987
Lock. See door lock. Nut lock. Firearm lock. Trunk lock.
Lock, W. D. Doremus..... 243,870 to 243,872
Lock hub, J. Schade (r)..... 9,787
Locomotives, cinder escape for, J. Shaw..... 243,805
Lounge and sofa bed, C. Scofield..... 243,732
Lubricating apparatus for bearings in machinery, J. S. Whitney..... 243,913
Lubricator, T. Holland..... 243,900
Lubricator for cylinders of air compressors, R. F. Grigsby..... 243,773
Macerating beets, etc., machine for, A. Perret.... 243,722
Magneto-electric machine, J. J. Wood..... 243,747
Measuring machine, cloth, J. M. Barnes..... 243,831
Meter. See grain meter. Spirit meter.
Milk can, H. B. Scoville..... 243,803
Milk cooler, W. M. Turner..... 244,002
Mitten, T. Ryan..... 243,728
Mould. See cigar mould.
Motor. See electro-magnetic motor.
Motor, A. & A. Iske..... 243,909
Mules and spinning frames, driving cylinder for, J. Hill..... 243,897
Musical instrument, mechanical, H. B. Nicherson 243,720
Musical instruments, key board for reed, T. Dawkins..... 243,861
Mustard, vessel for holding and dispensing, J. Gulden..... 243,884
Nail extractor, F. M. Stevens..... 243,812
Nails, manufacture of, D. J. Farmer..... 243,697
Net, fly, T. Grissinger..... 243,701
Newspapers, mechanism for counting folded, J. J. Clause *et al*..... 243,666
Nut lock, J. W. Wadsworth..... 244,004
Nut wrench, J. A. Miller..... 243,942
Oil cup for lubricating shafts, Gerdon & Schindler (r)..... 9,784
Oil for dressing leather, H. & C. Fink..... 243,876
Opera chair, Chambers & Burnett..... 243,849
Ore desulphurizing furnace, W. Moller..... 243,943
Organ action, reed, J. L. Hinners..... 243,899
Paint for roofs, etc., metallic, J. S. Smith..... 243,990
Paper bag machine, W. C. Cross..... 243,858
Paper pulp grinding engines, securing the knives used in, G. Smith..... 243,733
Paper pulp, wood grinding machine for, B. F. Perkins..... 243,965
Paper slitting machinery, J. Flanders..... 243,767
Parer and corer, apple, A. J. Rice..... 243,725
Petroleum and tar, apparatus for refining, T. Marrin..... 243,930
Photographic and other prints transparent, composition for rendering, E. W. Poston..... 243,968
Piano case, upright, G. M. Guild..... 243,700
Piano sounding board, M. J. Chase..... 243,689
Pill machine, P. Cauhapé..... 243,848
Pillow or bolster, W. T. Doremus..... 243,868, 243,869
Pipe. See waste pipe.
Pipes, device for threading, J. Miller..... 243,941
Pitcher, ice, J. M. Blackburn..... 243,838
Plaiting machine, F. R. Smith..... 243,989
Plant duster, S. Ruggles..... 243,727
Planter, cotton, F. M. Kimes..... 243,920
Plow, jointer, A. M. Ross..... 243,799
Plow, steam, C. B. Bostwick..... 243,845
Pneumatic dispatch tube, T. J. Mayall..... 243,784
Press. See cotton press. Cotton or other press. Hay and cotton press.
Protector. See telegraph wire protector.
Puller. See thistle puller.
Pulley block, J. W. Norcross..... 243,952
Pulley for hoisting machines, S. Stutz..... 243,738
Pump, G. Wilson..... 243,744
Pump, steam, J. Henshall..... 243,776
Pumps, automatic counterbalance to spear rods of mining, S. B. Connor *et al*..... 243,852
Pumping engine, steam, Thomson & Evans..... 243,814
Railway cross tie, G. W. Vroman..... 244,005
Railway signal and gate, B. Hempstead..... 243,892
Railway switch, A. F. Martel..... 243,933
Rake. See harvester reel rake. Horse rake.
Reel. Fisherman's reel.
Refrigerating apparatus by means of ammonia and other substances, T. Cook..... 243,759
Refrigerator H. A. Roberts (r)..... 9,786
Relay, Wright & Longstreet..... 243,824
Resawing machine, Connell & Dengler..... 243,692
Rice separator, A. Moore..... 243,944
Road engine, A. O. Frick..... 243,881
Road engines, steering gear for, A. O. Frick..... 243,880
Rocking chair, G. A. Nelson..... 244,021
Rope stand, P. W. Zeigler..... 244,017
Rule and balance, combined desk, S. E. Barton... 243,753
Sad iron heater, H. McConnell..... 243,935
Safe, provision, A. Osborne..... 243,958
Sawing machine, E. R. Hill..... 243,896
Sawing machine, circular, C. S. Beath..... 243,853
Sawing machine, heading, stave, and spoke, J. G. Wilson..... 243,745
Saw, mechanism for operating a drag, C. Jesseman 243,911
Scales for hides and tallow, weighing, J. H. Sparrow 243,811
Scourer. See grain scourer.
Scraper, earth, H. W. Ball..... 243,681
Scraper, earth, W. Haslup..... 243,890
Seed drill, S. Huffman..... 243,908
Separator. See rice separator.
Sewing and pegging jack, J. P. Busfield..... 243,755
Sewing machine, J. Keith..... 243,710
Sewing machine, Mullikin & Hartley..... 243,945
Sewing machine, H. F. Schlueter..... 243,729
Sewing machine embroidering attachment, E. T. Thomas..... 243,740
Sewing machine, shoe, H. Folsom (r)..... 9,791
Sewing machine shuttle, E. S. Yentzer..... 243,750
Sewing machine tension device, N. Duen..... 243,874
Shaft coupling, universal, W. Johnston..... 243,914
Sifter, ash, C. W. King..... 243,921
Signal. See railway signal.
Skate, roller, E. J. Cox..... 243,761
Skate, roller, J. K. Ross..... 243,979
Slaughtering apparatus, J. H. Sparrow..... 243,810
Sled, hand, F. M. Priestley..... 243,971
Sleigh bolster, H. L. Steele..... 243,992
Sleigh brace, W. H. Pettit..... 243,966
Soap, R. A. McCullough..... 243,936
Soap, manufacture of, P. Cassamajor..... 243,757
Soda, manufacture of, E. Solvay..... 243,991
Spiders, machine for grinding, Washburn & Merritt..... 244,010
Spirit meter recording mechanism, J. Leede..... 243,927
Spirits from grain, manufacturing distilled, T. A. & W. T. Jebb..... 243,910
Spring. See clock spring. Vehicle spring.
Stand. See cake and fruit stand. Rope stand.
Stand boiler, W. W. Austin..... 243,680
Steam and other engines, P., Sr., & F. E. Besnard, Jr..... 243,836
Steam boiler cleaner, A. Johnson..... 243,912
Steamer, food, J. E. Hoyt..... 243,906
Stereoscope and graphoscope, combined, L. Pattbers..... 243,964
Stool, piano, H. M. Ritter..... 243,794
Stove, cooking, C. Temme..... 243,739
Stove rest for culinary and other articles, W. L. McDowell..... 243,937
Sucker rod elevator, C. H. Cushing..... 243,859
Supporter. See trunk cover supporter.
Suppositories, composition for, L. Roth..... 243,800
Suspender end fastening, S. Wales..... 243,742
Swimming apparatus, W. Beeson..... 243,834
Switch. See interlocking switch. Railway switch.
Table fork, H. C. Hart..... 243,889
Tank. See disinfecting and automatic flush tank.
Tanning process, R. Koenitzer..... 243,923
Target ball, W. Wagner..... 244,005
Tea and coffee pot handle, A. Bayley..... 243,832
Tea canister, W. Welbourne (r)..... 9,789
Telegraph, quadruplex, S. D. Field..... 243,698
Telegraph wire, compound, T. J. Mayall..... 243,934
Telegraph wire protector, T. Wallace..... 244,007
Telephone, J. Goodman..... 243,893
Temperator for breweries, H. Stater, Jr..... 243,737
Test or thief, P. Newell..... 243,948
Thistle puller, T. & A. Turnbull..... 243,817
Ticket, pin, T. Moore..... 243,786
Tie. See railway cross tie.
Tile machine, E. Dodds..... 243,867
Torpedo boat, submarine, M. A. Hardy..... 243,888
Torpedo boat, submarine, M. Hubbe..... 243,907
Toy domino, C. M. Crandall..... 243,855
Trace holder, W. K. Hardenbrook..... 243,887
Trap. See gopher trap.
Truck, car, W. Robinson..... 243,797, 243,798
Trunk cover supporter, W. S. Soule..... 243,734
Trunk fastening, W. S. Soule..... 243,735
Trunk lock, H. C. Hunt..... 243,778
Tube. See pneumatic dispatch tube.
Valve. See hydrant valve.
Valve, steam actuated, Foster & Millward..... 243,703
Valve, stop, D. Buick..... 243,846
Vehicle spring, P. J. Kern..... 243,918
Ventilator, W. T. Cottier..... 243,760
Vessel and attachments thereto for submarine illuminating, R. S. Jennings..... 243,780
Violins, combined bow guide and rosin holder for, H. F. Dammon..... 243,763
Vise, A. M. Howard..... 243,903
Wagon brake, H. E. Rolph..... 243,977
Wagon implement, F. S. Dimon..... 243,865
Wagon, side bar, J. C. Walter..... 244,008
Washer. See clothes washer.
Washing machine, E. Crawley..... 243,856
Washing machine, A. Fleming..... 243,878
Waste pipe and fittings, T. C. Townsend..... 244,000
Watch winding mechanism, W. Gülzow..... 243,885
Watches, clocks, etc., jeweling of, C. H. Bagley... 243,828
Water closet, A. G. Myers..... 243 719
Wells, casting head for oil, M. W. Kahle..... 243,709
Wheat cleaner, magnetic, Delany & Morgan..... 243,862
Wheel. See car wheel.
Winding webbing, etc., machine for, T. G. Young 244,016
Windmill, D. Althouse..... 243,751
Windmill, T. E. Peckham..... 243,721
Window screens, etc., fabric for, I. E. Palmer..... 243,962
Wire screens, manufacture of, F. Preller..... 243,790
Wire stretcher, Ellwood & Watkins..... 243,764
Wrench. See nut wrench.

DESIGNS.

Comb, W. Byron..... 12,337
Finger ring, G. Krementz..... 12,339
Gas and lamp shade, F. S. Shirley..... 12,347
Glassware, Gennert & Gleason..... 12,349
Mantle ornament, W. S. McLewee..... 12,340
Oil cloth, C. T. & V. E. Meyer..... 12,341 to 12,346
Sewing machine frame, E. Woodward..... 12,348
Type, font of printing, H. Ihlenburg..... 12,338

TRADE MARKS.

Boiler rivets, Hoopes & Townsend..... 8,435
Brushes, toilet and other, F. Loonen & Son..... 8,429
Cigars, cigarettes, smoking tobacco, chewing tobacco, and snuff, L. Truitt..... 8,438
Clarets, P. W. Engs & Sons..... 8,423
Cleansing, washing, and polishing preparation, certain, N. T. Folsom & Co..... 8,433
Cologne water, J. M. Farina..... 8,426, 8,427
Fertilizing compounds, Atlantic and Virginia Fertilizing Company..... 8,431
Foods, farinaceous, J. & C. Lloyd & Co..... 8,424
Meats, smoked, F. A. Ferris & Co..... 8,428
Medical compound, D. S. Orton..... 8,437
Medicinal compound, Cullen & Newman..... 8,422
Medicine for the cure of rheumatism and dyspepsia, J. Webb..... 8,430
Petroleum for illuminating purposes, refined, Empire Refining Company..... 8,432
Saws of all kinds, Wheeler, Madden & Clemson Manufacturing Company..... 8,439, 8,440
Soda water fountains, J. C. Johnson..... 8,436
Thrashing machines, Aultman & Taylor Company.. 8,425
Tobacco, chewing, B. F. Gravely..... 8,434
Toilet compounds, chemical, C. G. Am Ende..... 8,421

Advertisements.

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

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

AUTOMATIC CABINET—PLAY ANY TUNE.
ORGANS ONLY $5.
Music, 4c. per foot. *Illustrated Catalogues free.*
THEO. J. HARBACH, 809 Filbert St., Philadelphia, Pa.

TANNING.—A VALUABLE TECHNICAL paper on the subject of: (1) *The Preliminary Preparation of Green Hides.*—Internal structure of the skins used for making leather; former treatment by caustic alkalies and sulphurets to remove the hair; more recent use of sulphate of sodium for the same purpose; removal of the alkalies; inflation of hides previous to (2) *Tanning.*—Theory of the tanning process; the former universal mode of tanning by vegetable materials and the great length of time it required; modern innovation of quickly effecting the result by the use of various mineral substances; the advantages of the latter method; objections that have been made to it; refutation of the arguments of its opponents. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 273. Price 10 cents. To be had at this office and from all newsdealers.

THE PORTER-ALLEN
High Speed Steam Engine.
ADDRESS
SOUTHWARK FOUNDRY & MACHINE CO.,
430 Washington Ave., Philadelphia, Pa.

CISTERN WATER.—A REPORT BY Prof. C. R. Stuntz to the Cincinnati Board of Health, on analysis of cistern waters, with table of analyses; deductions and observations by the author, and rules for the management of cisterns adopted by the Sanitary Committee of Cincinnati. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 277. Price 10 cents. To be had at this office and from all newsdealers.

A VALUABLE INVENTION.
We gave a brief notice, in our issue of January 8, of a simple, cheap, and efficient Gas Apparatus for generating Illuminating Gas, the patent having just previous been issued to Geo. H. Burrows, of Somerville, Mass., who has since secured his foreign patents, and, with Boston capitalists, organized a stock company, who, fully aware of the magnitude of the business, will confine their field of operation to the New England States, consequently offer State or Territorial rights, in any other State excepting New York and California, to any responsible party, and will furnish any one buying such rights one-half the necessary capital to do business with, for a corresponding interest in the business. Address
Electric Gas and Purifying Machine Co.,
85 State Street, Boston, Mass.

To Electro-Platers.
BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with Books of Instruction for Gold, Silver, or Nickel Plating. THOMAS HALL, Manufacturing Electrician, 19 Bromfield Street, Boston, Mass. Illustrated Catalogue sent free.

SIMPLE HOLTZ ELECTRICAL MACHINE, with experiments in static electricity. By Geo. M. Hopkins. Description of construction of several simplified forms of the Holtz electrical machine, with working drawings, to enable any one at slight expense to make a single or double plate apparatus. Accompanied by descriptions of a large number of highly interesting and instructive experiments in static electricity which may be performed with this machine, with directions for the application of static electricity in the cure of disease. Illustrated with 70 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENTS, Nos. 278, 279, and 282. Price 10 cents each, or 30 cents for the set. To be had at this office and from all newsdealers.

WOOD WORKING MACHINERY.
PLANING, MATCHING, MOLDING, & MORTISING,
TENONING, CARVING, MACHINES,
BAND & SCROLL SAWS
UNIVERSAL AND VARIETY WOOD WORKERS, &c. &c.
J. A. FAY & CO.
CINCINNATI, O. U. S. A.

DISPOSAL OF SEWAGE.—A PAPER read before the London Institution of Mechanical Engineers, by Mr Henry Chapman describing the Farquhar and Oldham filtering apparatus, for the disposal of the sewage of towns and villages, for the purification of the water supply of cities, and for the continuous filtration, in an economical manner of large volumes of liquid generally. With engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 276. Price 10 cents. To be had at this office and from all newsdealers. The same number contains an article on "*Paris Water Meters*," giving brief descriptions, with illustrations, of the four types of water meters adopted by the Parisian authorities; Kennedy's meter; Frager's meter; Samain's meter; and Mathelen and Deplechin's meter.

SHORTHAND Writing *thoroughly taught* by mail or personally. Situations procured for pupils when competent. Send for circular. W. G. CHAFFEE, Oswego, N.Y.

THE CULTIVATION OF CELERY.—A paper read before the Society for the Encouragement of Domestic Industry, by President Robinson, of Brown University, giving his practical experience of many years in raising celery. Celery as a wild plant. English mode of cultivation, as practiced in this country. The proper soil for cultivating the plant. Methods of blanching. How celery should be kept in winter. Packing. Profits on cultivation. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 279. Price 10 cents. To be had at this office and from all newsdealers.

50 BEAUTIFUL ALL NEW DESIGNS of Butterfly, Dragon-fly, Robin Redbreast, Pinks, Pansies, Violets, and Moss Rosebud Chromo Cards, name on, 10c. Card Mills, Northford, Ct.

SELECTION AND PREPARATION OF food.—By Miss Ruth Smith. A valuable essay, in which is discussed the various classes of foods in common use, the amount of nutritive value in each, the proper modes of preparing them for use. A paper of value in every household. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 271. Price 10 cents. To be had at this office and from all newsdealers. The same number contains a valuable article on the "Adulterations of Food," giving the results reached by Dr. Smart in his investigations, under direction of the National Board of Health, to determine the prevalence of adulteration in food supplies.

SEND TO LONDON, BERRY & ORTON PHILA PA FOR THE BEST BAND SAW BLADE

COMPRESSING AIR—BY JOHN STURgeon. An important paper, showing the most efficient and economical way of effecting the compression of air for use as a motive power. Illustrated with engraving of an air-compressor for obtaining low pressures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 279. Price 10 cents. To be had at this office and from all newsdealers.

FLORIDA STEAM SAW MILL FOR SALE. New, in good running order. Directly on line of So. Fla. R. R., Orange Co., only two miles from Junction. Can't keep up with its orders. Demand, prices increasing. Timber plentiful. Clearing $300 per month. In center most thriving county in State. Special reason for sale. Address A. W. WALLIS, Maitland, Fla.

SEPARATION OF FATS, OILS, GLYcerine, etc.—Full text of the decision of the Supreme Court of the United States, sustaining the Tilghman patent, containing a large amount of valuable information concerning the chief industries relating to glycerine, fats, and oils, with interesting allusions to other discoveries. History of the decomposition of fats. Patents for processes. Neilson's hot blast process. Morse's telegraph patent. Who may obtain patents. The question of infringement, etc. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 278. Price 10 cents. To be had at this office and from all newsdealers.

FOR SALE.
The entire patent right for a new and valuable improvement in Lamp Tops; forming a splendid article for manufacture, on which large profits can be made at a small outlay. Address, for full particulars,
J. J. HENTZ, 114 South Charles St., Baltimore, Md.

PERPETUAL TENSION PROPELLING BELT FOR SEWING MACHINES FEET SAWS & ALL KINDS OF MACHINERY
The Climax Sash Cord, for suspending sash, &c., and The Perfect Door Spring, for closing doors, are more simple, durable and economical than any in use. Once tried no other will be used. Agents Wanted Send for circular T. P. T. P. B. Co. 369 7 Ave. N. Y.

MACHINES FOR PRODUCING COLD air.—A paper read by Mr. T. B. Lightfoot, before the Institution of Mechanical Engineers, London, giving a brief description of each of the machines hitherto devised for producing cold air; and including the theory, construction, and practical working of a greatly improved form of apparatus for the same purpose. Illustrated with an engraving giving perspective view of one of these machines as constructed for marine purposes, and intended to supply 5,000 cubic feet of cold air per hour. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 274. Price 10 cents. To be had at this office and from all newsdealers.

Will sell the RIGHT to WRITE a book for one thousand dollars. Subject new! A positive demand. Address MRS. A. E. LEWLER, Onargo, Iroquois Co., Ill.

OHIO STATE UNIVERSITY Mechanical Department. The best place in the West to study Mechanical Engineering. Laboratory method. Shop practice. All modern advantages. Tuition free. Expenses very low. Address Prof. S. W. ROBINSON, Columbus, O.

ELEVATORS HAND POWER AND HYDRAULIC FREIGHT & PASSENGER SHAFTING PULLEYS & HANGERS L. S. GRAVES & SON ROCHESTER N.Y.

BLACKSMITHS and Carriage Makers should send for a free specimen copy of "THE BLACKSMITH AND WHEELWRIGHT" (size of SCIENTIFIC AMERICAN), filled with practical information, and copiously illustrated. M. T. RICHARDSON, Publisher, 49 Barclay Street, N.Y.

TRANSPARENT CARDS. Make no mistake They are the finest you ever saw! Each card contains a unique scene. 25 with name on, 10 cts. Address HUB CARD CO., Boston, Mass

BATTERIES, WIRES, MAGNETS, INSTRUMENTS, TELEGRAPH AND ELECTRICAL SUPPLIES. CATALOGUE FREE. C. E. JONES & BRO., CINCINNATI, O.

NEW BOOK
ON
MODERN MILLING
JUST PUBLISHED.

Modern Milling. Being the substance of two addresses delivered by request of the Franklin Institute, Philadelphia. By Robert Grimshaw, Ph.D. Illustrated by 28 engravings. 8vo cloth, ... $1.00

We also publish:

Craik.—The Practical American Millwright and Miller. By David Craik, Millwright. Illustrated by wood engravings and folding plates. 8vo, ... $5.00

Hughes.—American Miller and Millwright Assistant. Illustrated. 12mo, ... $1.50

Pallett.—Miller's, Millwright's, and Engineer's Guide. Illustrated. 12mo, ... $3.00

☞ The above, or any of our Industrial and Technical Books, sent by mail, free of postage, at the publication prices, to any address in the world.

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

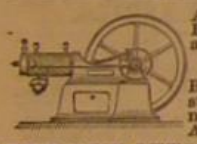
SWEEPSTAKES, WITH THE ELLIS Patent Journal Box. The best Planer and Matcher ever made. Planing 20 in. wide, 6 in. thick, weight 2,200 lbs., $300; planing 24 in. wide, 8 in. thick, weight 2,600 lbs., $350. Beading, Arbor, and Head, extra, $20. Sash, Door, and Blind Machinery a specialty. Send for descriptive catalogue to Rowley & Hermance, Williamsport, Pa.

50 All Gold, Chromo, and Lit'g Cards (No 2 alike), Name on, 10c. Clinton Bros., Clintonville, Conn.

NEW YORK STENCIL WORKS
STEEL LETTERS STEEL STAMPS STEEL DIES, &c
87 NASSAU ST. N.Y.

Geo. W. Read & Co.,
Manufacturers of and Dealers in
MAHOGANY,
And all Foreign and Domestic
Cabinet Woods.
SOLE MANUFACTURERS
CUT AND PRESS DRIED
THIN LUMBER,
FOR
CIGAR BOXES,
Panel Stock, Etc., Etc.

Mills and Warerooms:
186 to 200 Lewis St., New York.



An engine that works without Boiler. Always ready to be started and to give at once full power. SAFETY, ECONOMY, CONVENIENCE. Burns common Gas and Air. No steam, no coal, no ashes, no fires, no danger, no extra insurance. Almost no attendance.

THE NEW OTTO SILENT GAS ENGINE.
Useful for all work of small stationary steam engine. Built in sizes of 2, 4, and 7 H. P. by SCHLEICHER, SCHUMM & CO., 345 Chestnut Street, Phila., Pa. A. C. Manning, 38 Dey St., New York, Agent.

WOOD-WORKING MACHINERY.
☞ Universal Wood Workers, Planing, Matching, Moulding, Band and Scroll Sawing Machines, Carriage, Wagon and Wheel Machinery, etc.
BENTEL, MARGEDANT & CO.,
HAMILTON, OHIO, U.S.A.

THE MEDART PATENT WROUGHT RIM PULLEY
THE LIGHTEST, STRONGEST, NO SHRINKAGE STRAINS, PERFECT BALANCE.
THE CHEAPEST PULLEY IN THE MARKET
ANY SIZE OR FACE, STRAIGHT OR CROWNED, TIGHT OR LOOSE, SPLIT OR WHOLE, SINGLE, DOUBLE OR TRIPLE ARMS. LARGE PULLEYS A SPECIALTY.
THE HARTFORD ENGINEERING CO. HARTFORD CONN.

PATENTS.

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 *thirty-five years' experience*, and now have *unequaled 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, 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 reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infrigements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

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.

MUNN & CO., Solicitors of Patents,
37 Park Row, New York.

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

NEW YORK BELTING AND PACKING COMP'Y.
The Oldest and Largest Manufacturers of the Original
SOLID VULCANITE
EMERY WHEELS.
All other kinds Imitations and Inferior. Our name is stamped in full upon all our standard BELTING, PACKING, and HOSE.
Address NEW YORK BELTING AND PACKING CO.,
Emery Wheel. JOHN H. CHEEVER, Treas. NEW YORK.

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

BIBB'S
Celebrated Original
BALTIMORE
FIRE-PLACE HEATERS
To warm upper and lower rooms. The handsomest, most economical Coal Stoves in the world.
B. C. BIBB & SON
Foundry Office and Salesrooms, 39 and 41 Light Street,
Baltimore, Md.
MANUFACTURED SLATE MANTELS.
☞ *Send for Circulars.*

CIVIL, MECHANICAL, AND MINING ENGINEERING at the Rensselaer Polytechnic Institute, Troy, N. Y. The oldest engineering school in America. Next term begins September 15. The Register for 1880-81 contains a list of the graduates for the past 34 years, with their positions; also, course of study, requirements, expenses, etc. Address
DAVID M. GREENE, Director.

PROSPECTING MINERAL LANDS A SPECIALITY.
CYLINDRICAL SECTIONS OR CORES OBTAINED THE WHOLE DISTANCE BORED. ARTESIAN WELLS BORED ROUND AND STRAIGHT ADMITTING A LARGER PUMP AND CASING IN PROPORTION TO SIZE OF HOLE THAN BY ANY OTHER PROCESS. ESTIMATES GIVEN AND CONTRACTS MADE BY THE
PENNSYLVANIA DIAMOND DRILL CO.
BOX 423 POTTSVILLE PA.
MANFTRS. OF DIAMOND DRILLS FOR ALL KINDS OF ROCK BORING.

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

"BLAKE'S CHALLENGE" ROCK BREAKER.
Patented November 18, 1879.

For **Macadam Road** making, Ballasting of **Railroads**, Crushing **Ores**, use of **Iron Furnaces**, etc. Rapidly superseding our *older styles* of Blake Crusher on account of its superior *strength, efficiency*, and *simplicity*. Adopted by important Railway and Mining Corporations, Cities, and Towns. First Class Medals of *Superiority* awarded by American Institute, 1879 and 1880.
BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

MACHINERY
of every description. 121 Chambers and 103 Reade Sts., New York. THE GEORGE PLACE MACHINERY AGENCY.

BEATTY'S ORGANS, 18 useful stops, 5 sets reeds, only $65. Pianos, $125 up. ☞ Illus. Catalogue FREE. Address BEATTY, Washington, N. J.

DEAN BROTHERS,
Steam Pump Works,
INDIANAPOLIS, IND.,
Manufacturers of
BOILER FEEDERS AND PUMPING MACHINERY,
FOR ALL PURPOSES.
Send for new Illustrated Catalogue.

NOW READY—The New Edition of Trautwine's Civil Engineer's Pocket Book. 12mo. 691 pages, illustrated with 680 engravings from original designs. Fifteenth thousand. Revised, corrected, and enlarged. E. CLAXTON & CO., 930 Market St., Philadelphia, Pa.

165 RACE ST. JAS. MURDOCK JR. CINCINNATI
MACHINISTS' SUPPLIES IN GERMAN
BRASS, COPPER, SILVER.
SEND FOR WIRE, ROD, SHEET & TUBE IN THE THREE METALS. PRICE LIST

HOW TO SOFTEN HARD WATER.—Description of Dr. Clarke's simple process for softening hard waters, and at the same time purifying the water. This paper is of much value and interest. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 270. Price 10 cents. To be had at this office and from all newsdealers.

HOME
DO YOUR OWN PRINTING
Presses and outfits from $3 to $500 Over 2,000 styles of type. Catalogue and reduced price list free.
H. HOOVER, Phila., Pa.

RUPTURE
cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.

SUPERIOR SUBSTITUTE FOR WOOD ENGRAVING.
MOSS ENGRAVING CO.
INCORPORATED 1880. (MOSS'S NEW PROCESS.)
535 PEARL STREET, COR. ELM, NEW YORK.
Engravings of Portraits, Buildings, Landscapes, Machinery, Maps, Etc., for Newspapers, Books, Catalogues, Etc. Much cheaper than Wood Cuts.
THE LARGEST ESTABLISHMENT OF THE KIND IN THE WORLD.

WHEELER'S PATENT WOOD FILLER
Fills the pores of wood perfectly, so that smooth finish is obtained with one coat of varnish. Send for circular. Mention this paper
BRIDGEPORT WOOD FINISHING CO.,
40 Bleecker Street, New York.

PATENT QUICK
Adjustable Stroke
SHAPERS
Can be Changed while in Motion.
E. GOULD & EBERHARDT,
NEWARK, N. J.

$50 Per week. INTELLIGENT AGENTS can earn with the Walke Flexible Fountain Cold Pen. No dipping for Ink. Writes Four Days without re-filling. Only first-class men need apply. Address WALKE PEN M'F'G CO., Hamilton, Ohio, or 853 Broadway, New York.

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

DEAF PECK'S PATENT INVISIBLE EAR DRUMS, A Grand Success. Send for treatise. DR. PECK, 853 Broadway, New York. Also Prop. Dr. Sisson's Catarrh & Asthma Cures.

$72 A WEEK. $12 a day at home easily made. Costly outfit free. Address TRUE & Co., Augusta, Me.

PAYNE'S AUTOMATIC ENGINES.

Spark Arrester.

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

DUC'S ELEVATOR BUCKET,
For use in Grain Elevators, Flour Mills, Sugar Refineries, and Mills of every kind. They are made of Charcoal Stamping Iron, extra strong and durable. Have no corners to catch. 300,000 in use.
THOS. F. ROWLAND, Sole Manufacturer, Brooklyn, N. Y.

PATENTS SOLD
Partners Secured.
Joint Stock Companies formed. Stock placed for Incorporated Companies. Good investments always on hand. Highest references given. Circulars free. E. L. RICHARDS & CO., Brokers, 733 BROADWAY, New York.

OLD RELIABLE.
NO FAILURE IN SIXTEEN YEARS
HEALD & MORRIS CENTRIFUGAL PUMPS
100 TO 35,000 GALLS PER MINUTE CAPACITY
HEALD & MORRIS, Baldwinsville N.Y.

FOR SECOND-HAND ENGINES,
Address HARRIS IRON WORKS, Titusville, Pa.

$66 a week in your own town. Terms and $5 outfit free. Address H. HALLETT & Co., Portland, Me.

THE SCOVILL "Pop" Safety Valve,
SIMPLE, RELIABLE, DURABLE.
For Locomotive, Stationary, Marine, and Portable Boilers.
Send for descriptive circulars and price lists to
THE HANCOCK INSPIRATOR CO.,
BOSTON, MASS.

BOOKWALTER ENGINE.
Compact, Substantial, Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of

3	HORSE POWER	$240.00
4½	" "	280.00
6½	" "	355.00
8½	" "	440.00

☞ Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio,
or 110 Liberty St., New York.

FORSTER'S CRUSHER AND CRUSHER AND PULVERIZER,
The simplest machine ever devised for the purpose.
We warrant 50 per cent. advantage in Crushing, with one-third power, and in combined Crushing and Pulverizing do the work of stamp and Burrs at one-third first cost. Can be *operated with any kind* of power.
Address TOTTEN & CO., Pittsburg, Pa.

ROOTS' NEW IRON BLOWER.

POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED
IS SIMPLER, AND HAS
FEWER PARTS THAN ANY OTHER BLOWER.
P. H. & F. M. ROOTS, Manuf'rs,
CONNERSVILLE, IND.
S. S. TOWNSEND, Gen. Agt., 6 Cortlandt St., 8 Dey Street,
WM. COOKE, Selling Agt., 6 Cortlandt Street,
JAS. BEGGS & CO., Selling Agts., 8 Dey Street,
} NEW YORK.
☞ SEND FOR PRICED CATALOGUE.

WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

THE BEST Drawing Paper for Maps, Plans, Mechanical Drawings, is the PARAGON Paper. Send for Samples.
KEUFFEL & ESSER, New York.

THE BAKER BLOWER.
[FORCED BLAST.]

The best in the World for Charcoal Blast Furnaces.
Also for melting Iron in Cupolas for Stove Foundries, etc.
WILBRAHAM BROS.,
No. 2320 Frankford Avenue,
PHILADELPHIA, PA.
☞ SEND FOR OUR CATALOGUE.

OUR BRAVE PRESIDENT
A Memento of His Assassination.
An Elegant Engraving, Size 19 x 24.

Containing a splendid portrait of PRESIDENT GARFIELD and NINE PORTRAIT ENGRAVINGS OF HIS CABINET. With statistics of our national prosperity, education, Church and State. Various vignettes, two correct views of the obelisk in Central Park, and a unique historical engraving of **George Washington.** No description with the pen will enable you to form any idea of this beautiful work of art. It has been pronounced by all who have seen it as the most elegant and artistic piece of work of modern times. Some idea may be formed when we say that the artist's work alone cost over **$2,000. FREE.** Being the publishers of this beautiful picture, and wishing to present to EVERY READER OF THIS ADVERTISEMENT a Souvenir of OUR BRAVE PRESIDENT, we make the following liberal offer: For SEVENTY-FIVE CENTS we will send the above described work of art and our elegantly illustrated HOUSEHOLD GUEST MAGAZINE, each number containing 48 pages of beautiful illustrations and choice reading, for six months for only SEVENTY-FIVE CENTS. The price of the magazine is **$1.50 per year**, so we actually give you the engraving FREE. This offer is made for two purposes: First, to introduce our magazine into every family where it is not now taken; second, because it gives us great pleasure to be able to place such a souvenir in every American home. The price of the engraving alone has been fixed at **$1.00 per copy**, and it will be worth double the price. If, however, you want the picture without the magazine, we will mail it to you, postpaid, for **50 Cents** in cash, or postage stamps, and money will be cheerfully refunded if you are not more than satisfied with your purchase. No patriotic citizen of any party should be without it. As to our responsibility, we refer to any New York publishers. Address all orders to **E. C. RIDEOUT & CO., 10 Barclay St., N. Y.** (AGENTS WANTED.)

PATENT BENDING ROLLS,
For Heavy Punches, Shears, Boiler Shop Rolls, Radial Drills, etc., send to
HILLES & JONES, Wilmington, Del.

TO MACHINISTS.
Ask for the Hartford Hammer Co. Adze Eye Machinist's Hammer. The best finish and quality in the market. For Sale by Hardware and Manufrers' Supply Houses.

THE WALLACE DIAMOND CARBONS.
Telegraph, Telephone, and Electric Light Supplies.

THE ELECTRICAL SUPPLY CO.,
109 Liberty St., New York.

YOUNG MEN
READ THIS
We will send **ON TRIAL** (before purchasing)
Dr. Joy's Celebrated Electric Devices,
Invented by **Prof. Douglas A. Joy**, of the **University of Michigan**, especially for the cure of all **Nervous Diseases, General Debility, Lost Vigor** and **Manhood**, the results of **abuses** and **other causes.** Also for Liver and Kidney Diseases, Rheumatism, Neuralgia, Paralysis, **Female Troubles** and **many other diseases.** Wonderful cures quickly effected. Illustrated book sent free. Address the manufacturers,
WAGNER & CO., Chicago, Ill.

BOILERS SAFE FROM DESTRUCTIVE EXPLOSION. 25,000 H.P. IN USE. SEND FOR CATALOGUE.
HARRISON BOILER WORKS, PHILA.

FOR SALE.
The following Wire Rope Sheave Pulleys, of Roebling's Sons' make, are for sale:

One 11 ft. Pulley, cast in halves		$100.00
One 7 ft. " "	solid	35.00
Two 4 ft. Pulleys, " "		30.00 each.

All the Pulleys are in good order. Will deliver them at R. R. depots in Wilkesbarre, Pa. for the above price. Address PAUL A. OLIVER, Wilkesbarre, Pa.

Advertisements.

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

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

Estab'd **EAGLE ANVILS.** 1843.
Solid **CAST STEEL** Face and Horn. Are Fully Warranted. Retail Price, 10 cts. per lb.

Double Screw, Parallel, Leg Vises.
Made and WARRANTED *stronger* than any other Vise by **FISHER & NORRIS** only, **Trenton, N. J.**

"1880" Lace Cutter. By mail, 50c. Discount to the trade. Sterling Elliott, 262 Dover St., Boston, Mass.

ENSILAGE POWER! Our 2-Horse Eureka Engine and Boiler is just the thing—SAFE, CONVENIENT, DURABLE. B. W. PAYNE & SONS, Corning, N. Y.

BOILER COVERINGS,

ASBESTOS-LINED, REMOVABLE.
THE PATENT AIR SPACE COVERINGS.
THE CHALMERS-SPENCE CO., Sole Proprietors, 10 Cortland St. Foot of East 9th St., New York.

FOR SALE.—Steam Mill in North part of State. New first-class engine and machinery. Beside railroad. Good location for chair, broom, and fork handle, or other wood manufacture. A bargain for cash. WM. IRWIN, 152 Broadway, New York.

H.W.JOHNS' ASBESTOS LIQUID PAINTS,
ASBESTOS ROOFING,
ASBESTOS BOILER COVERINGS,
ASBESTOS LINING FELT,
ASBESTOS STEAM PACKING,
ASBESTOS WICK PACKING,
ASBESTOS FLAT PACKING,
ASBESTOS MILLBOARD,
ASBESTOS GASKETS,
ASBESTOS SHEATHINGS,
COATINGS, CEMENTS, Etc.
Descriptive price lists and samples sent free.
H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.

BARREL, KEG, HOGSHEAD, AND STAVE MACHINERY.

Over 50 varieties manufactured by E. & B. HOLMES, Buffalo, N. Y.

FOR SALE.—U. S. PATENT OF VALUABLE FLOURING MILL MACHINE. Very popular and profitable. H. C., Box 773, New York.

NEW YORK BELTING AND PACKING COMPANY.
Wellington Mills Emery
Used in **ONLY** our Wheels.
37 & 38 PARK ROW, NEW YORK.

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

FRIEDMANN'S PATENT INJECTOR.
THE BEST
Boiler Feeder
IN THE WORLD.
Simple, Reliable, and Effective.
40,000 IN ACTUAL USE.
NATHAN & DREYFUS,
Sole Manufacturers, NEW YORK.
Send for Descriptive Catalogue

SHEET METAL DROP PRESSES.
STILES & PARKER PRESS CO., Middletown, Conn.

HOLCOMB'S NEW
Amplifying Telephones,
FOR PRIVATE LINES.
The latest and best. Patented April 26, 1881. These new instruments embody recent and important improvements. They transmit conversation, music, orders, etc., with almost electric speed and surprising fidelity. The only durable and reliable substitute for the Electric Telephones. Work two miles. Price $10 per set. Illustrated Circulars FREE.
[Mention this paper.] HOLCOMB & CO., Mallet Creek, O.

Mill Stones and Corn Mills.
We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys, and Gearing specially adapted to Flour Mills. Send for catalogue.
J. T. NOYE & SONS, Buffalo, N. Y.

HOLDS INK FOR A WEEK'S USE. ANY GOOD INK MAY BE USED.
The Mackinnon IRIDIUM POINTED Pen or Fluid Pencil.

THE ONLY RESERVOIR PEN IN THE WORLD WITH A CIRCLE OF IRIDIUM AROUND THE POINT.
Always ready. Always with you. Cannot Blot. Cannot be worn out in a lifetime.
MacKINNON PEN CO., 192 BROADWAY, CORNER JOHN STREET, NEW YORK.
General Supply Depots in all principal cities in America and Europe.

Applied to all machinery driven by fly-wheels and liable to be broken by power stored in wheels, such as calender rolls, upsetting machines, presses, and wire drawing machines. We warrant to save gearing and all machinery from breaking by using our clutches. Starts gradual, stops quick. Any amount of power controlled. **Friction Hoisting Engines and Drums;** also, Safety Elevators. Can be run faster and stop quicker than any other friction. **D. Frisbie & Co.,** New Haven, Ct.

ICE AT $1 00 PER TON.
PICTET ARTIFICIAL ICE CO., Limited, P. O. Box 3883. 142 Greenwich St., New York. Guaranteed to be the most *efficient* and *economical of all* existing Ice and Cold Air Machines.

Jenkins' Patent Packing and Valves.
"THE STANDARD."
Jenkins' Packing has *never failed* to make a perfect joint where directions were followed. Jenkins' Valves are warranted steam tight and are made of the best steam metal. JENKINS BROS., 71 John St., New York.

SHAFTS PULLEYS HANGERS
At Low Prices. Large Assorted Stock.
A. & F. BROWN, 57-61 Lewis St., New York.

ROOFING.
For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.

Jarvis Furnace Co.
Patent Setting for Steam Boilers Burns Screenings and Slack Coal without Blast. No. 7 Oliver St., Boston; No. 92 Liberty St., New York: No. 709 Market St., St. Louis; No. 1 Second St., Baltimore.

SUPPLIES FROM HYDRANT PRESSURE the cheapest power known. Invaluable for blowing Church Organs, running Printing Presses, *Sewing Machines in Households*, Turning Lathes, Scroll Saws, Grindstones, Coffee Mills, Sausage Machines, Feed Cutters, *Electric Lights*, Elevators, etc. It needs little room, no firing up, fuel, ashes, repairs, engineer, explosion, or delay, no extra insurance, no coal bills. Is noiseless, neat, compact, steady; will work at any pressure of water above 15 lb.; at 40 lb. pressure has 4-horse power, and capacity up to 10 horse power. Prices from $15 to $300. Send for circular to THE BACKUS WATER MOTOR CO., Newark, N. J., or 323 Broadway, New York.

NOISELESS ROTARY FANS.
These fans can be fastened to ceiling or side wall, and driven by a round belt direct from a Backus Water Motor, Steam Engine, or other power. Blades can be covered with paper muslin to suit the taste in color. By changing angle of blade amount of air can be regulated. Two or more fans can be connected on ceiling. Shaft of fan runs in metalline journals, and requires no oiling, which is quite a consideration where they are put up in dining rooms over tables. Price $5 each.
Manufactured by Backus Water Motor Co., 323 Broadway, New York.

THE J. L. MOTT IRON WORKS,
88 and 90 Beekman St., New York.
Demarest's Patent Water Closets used almost exclusively in all fine work. **Demarest's** Water Closets, Latrine's and Hopper's for public buildings and factories. **Mott's Celebrated Porcelain Lined Baths** unequaled for beauty and cleanliness. **Sanitary Goods** of all kinds.

FOR BEST **COLD PENS.**
Send for Price List to JOHN HOLLAND, Mfr., 19 West 4th St., Cincinnati.

ROCK DRILLS, COMPRESSORS, FUSE, BATTERIES, POWDER.
RAND DRILL CO., 240 Broadway, N. Y.

ROLLESTONE LATHE,
Improvement over the Waymoth Lathe.

Latest improved. Rotary and Stationary Bed Planers and Buzz Planers; Band Saws; *Wardwell's Patent Saw Bench* Dowel Machine; Chair Machinery; Boring Machines, etc. *Also large stock of Second-hand Machinery*, consisting of Machinists' Tools, Wood Working Machinery, Engines, Boilers, *on hand*. Send stamp for catalogue, and state just what you want, to ROLLESTONE MACHINE Co., 48 Water St., Fitchburg, Mass.

MACHINISTS' TOOLS.
Iron Planing Machines
A SPECIALTY.
WHITCOMB MFG. CO., Worcester, Mass.

TO INVENTORS AND MANUFACTURERS
The Semi-Centennial Exhibition
Of the American Institute of the City of New York will open September 14, 1881. Heavy machinery will be received as early as August 22; other goods, September 5. Intending exhibitors must make early application to secure proper space and classification. For blanks and information address **General Superintendent American Institute,** New York City.

Horizontal Steam Engines,

For Economy, Durability, and Superior Design,
Complete in Every Respect,
ADDRESS
LAMBERTVILLE IRON WORKS, LAMBERTVILLE, N. J.

ERICSSON'S
New Caloric Pumping Engine
FOR
DWELLINGS AND COUNTRY SEATS.
Simplest cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.
DELAMATER IRON WORKS
C. H. DELAMATER & CO., Proprietors,
No. 10 Cortlandt Street, New York, N. Y.

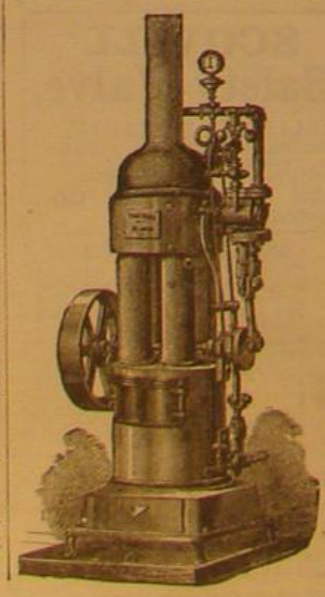
WM. A. HARRIS,
PROVIDENCE, R. I. (PARK STREET).
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements, from 10 to 1,000 H. P.

STUTTERING cured by Bate's appliances. Send for description to SIMPSON & CO., Box 2236, New York.

KORTING **UNIVERSAL INJECTOR**
FOR BOILER FEEDING
Send for circular
PHILADA. 12 & THOMPSON STS.
NEW YORK 109 LIBERTY ST.
BOSTON 7 OLIVER ST.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

ESTABLISHED 1844.



JOSEPH C. TODD,
Successor to
TODD & RAFFERTY, PATERSON, N. J.,
Engineer and Machinist,
Flax, Hemp, Jute, Rope, Oakum, and Bagging Machinery, Steam Engines, Boilers, etc. Sole agent for Mayher's New Patent Acme Steam Engine and Force Pump combined. Also owner and exclusive manufacturer of
The New Baxter Patent Portable Steam Engine.
These engines are admirably adapted to all kinds of light power for driving
PRINTING PRESSES,
pumping water, sawing wood, grinding coffee, ginning cotton, and all kinds of agricultural and mechanical purposes, and are furnished at the following low prices:

1 Horse Power,	$150	1½ Horse Power,	$190
2 Horse Power,	245	2½ Horse Power,	275
3 Horse Power,	290	4 Horse Power,	350

Send for descriptive circular. Address
J. C. TODD, Paterson, N. J.,
Or No. 10 Barclay St., New York.

THE
New York Ice Machine Company,
115 Broadway, New York, Room 78.
LOW PRESSURE BINARY ABSORPTION SYSTEM.
Machines Making
ICE AND COLD AIR.
Low Pressure when running. No pressure at rest. Machines guaranteed by C. H. Delamater & Co.

TO INVENTORS
THE
Howard Manufacturing Co.
(INCORPORATED,)
364 & 366 Broadway, New York.
Organized for the manufacture and introduction of
PATENTED NOVELTIES AND YANKEE NOTIONS,
OF EVERY DESCRIPTION.
AMPLE CAPITAL.
Latest Improved Machinery.
CONNECTIONS WITH ALL WHOLESALE MERCHANTS IN THE UNITED STATES AND CANADA.
Agents in Foreign Countries.
Correspondence without charge, with all who desire their inventions *in our line* developed.

PROSPECTUS
OF THE
Scientific American
FOR 1881.
The Most Popular Scientific Paper in the World.

VOLUME XLV. NEW SERIES.
COMMENCES JULY 1.

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 progressive 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.

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

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

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

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, 1 year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for 1 year. This includes postage, which we pay. Remit by postal order or draft to order of Munn & Co., 37 Park Row, New York.

PRINTING INKS.
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

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

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

Vol. XLV.—No. 7. [NEW SERIES.] NEW YORK, AUGUST 13, 1881. [$3.20 per Annum. [POSTAGE PREPAID.]

IMPROVED BAND LOG SAW MILLS.

The gradual yet rapid depletion of the American forest and lumber regions the past few years, the increase in consumption of nearly every kind of lumber into the thousand-and-one articles into which it is so cheaply and easily converted, has led to a growing scarcity and very material increase in price of nearly every variety of hard and soft wood lumber, especially that used in coach, cabinet, car, and house-building purposes.

To supply the enormous and growing demand, large shipments and importations of mahogany, ebony, red and white woods, and white and yellow pines, are constantly being made from South America, Mexico, Canada, and California. It is said that the single article of black walnut lumber, which twenty-five years ago brought only about $25 per thousand feet at the mills where cut, to-day, in the lumber market, commands from $75 to $150 per thousand feet, while in some localities very choice and evenly-sawed lots command still higher prices than these, and in fact is already quite a difficult article to obtain.

This scarcity has become so serious a question that attention has already been turned to the question of devising better means for reducing the logs and deals into boards, and by the use of a thinner saw blade produce a greater per cent of good lumber, and save the enormous kerf wastage, said to be from 15 to 20 per cent in most circular and other mills.

Any machine or tool that will effect such a saving in the making of lumber is a cheap investment at most any price, and especially is it so in the sawing of the fine and higher grades of lumber. The old adage, "the best is the cheapest," is particularly applicable in this case, whether the price be high or low. In these days of improvement, he who would best succeed must have the best. Profits in lumber making, like many other things, seem to go with those having the most approved appliances and best facilities. Particularly true is this in sawing lumber. Here a constant loss either in quality of product or amount of production, according to running expenses, puts the owner at a disadvantage as respects more enterprising rivals, and frequently determines the question of his success or failure.

Any one can see at a glance that a few hundred feet more or less a day; a few cents per thousand difference in the expense of production; the effect upon the market value, or even ability to sell at market prices, due to even or uneven sawing, very soon amounts to more than the first cost of the machinery. On the one hand, disappointment and failure; on the other, success and competency follow.

Believing this matter one of no little interest to a large number of our readers, we take pleasure in laying before them an engraving made on the spot by our artist, also a description of a new band log saw mill (both front and rear views) designed for sawing black walnut and other high priced lumber, as it was seen running in one of our Western saw mills.

It is from the establishment of the celebrated American wood machinery builders, Messrs. J. A. Fay & Co., of Cincinnati, O., well known, we think, to most of our readers.

The machine proper, except the carriage, is mounted on a heavy cast iron sole plate which sustains and supports all the operative parts. The operator, without changing his position, has entire control of the mill, and can start or stop it, change the feed, or vary the direction of the carriage at will. It is massive and substantial, wheels 72 inches in diameter, and arranged so the saw can be made to run on any portion of the wheel almost instantly. The guides—upper and lower—are those peculiar to all of the Fay & Co. machines, having a wheel to receive the back thrust of the saw, and lateral supporting side guides or packing plates to suit the thickness of the saws; the upper guide is also so arranged that it can be raised or lowered instantly to any desired size of log, and yet will always remain in a true vertical line with the lower one—a very important feature. The carriage head blocks and set works are the most improved known. The log is set with the greatest ease and convenience, and with unerring accuracy. The set works are arranged to be operated in the most expeditious manner. The carriage runs on friction rolls. The side supports are arranged so as always to secure an even thickness of the last board. Rests at the same distances apart as the side supports afford a decided advantage over ordinary mills in edging up boards and splitting plank into scantling.

The nearness together of blocks saves any change or moving of head blocks in sawing logs of different lengths. No calculation is required to leave the last board of the desired thickness.

The operator and assistant stand at the sides of the carriage, where logs can be easiest handled, and where the proper set, when slabbing, can be determined. The position of the sawyer has the further advantage of enabling him to cut different grades of lumber in the same log into the most suitable dimensions.

A single improved dog quickly operated holds securely any size of logs until nearly finished. Sliding dogs can be quickly applied to hold the last board without tearing or otherwise injuring the lumber.

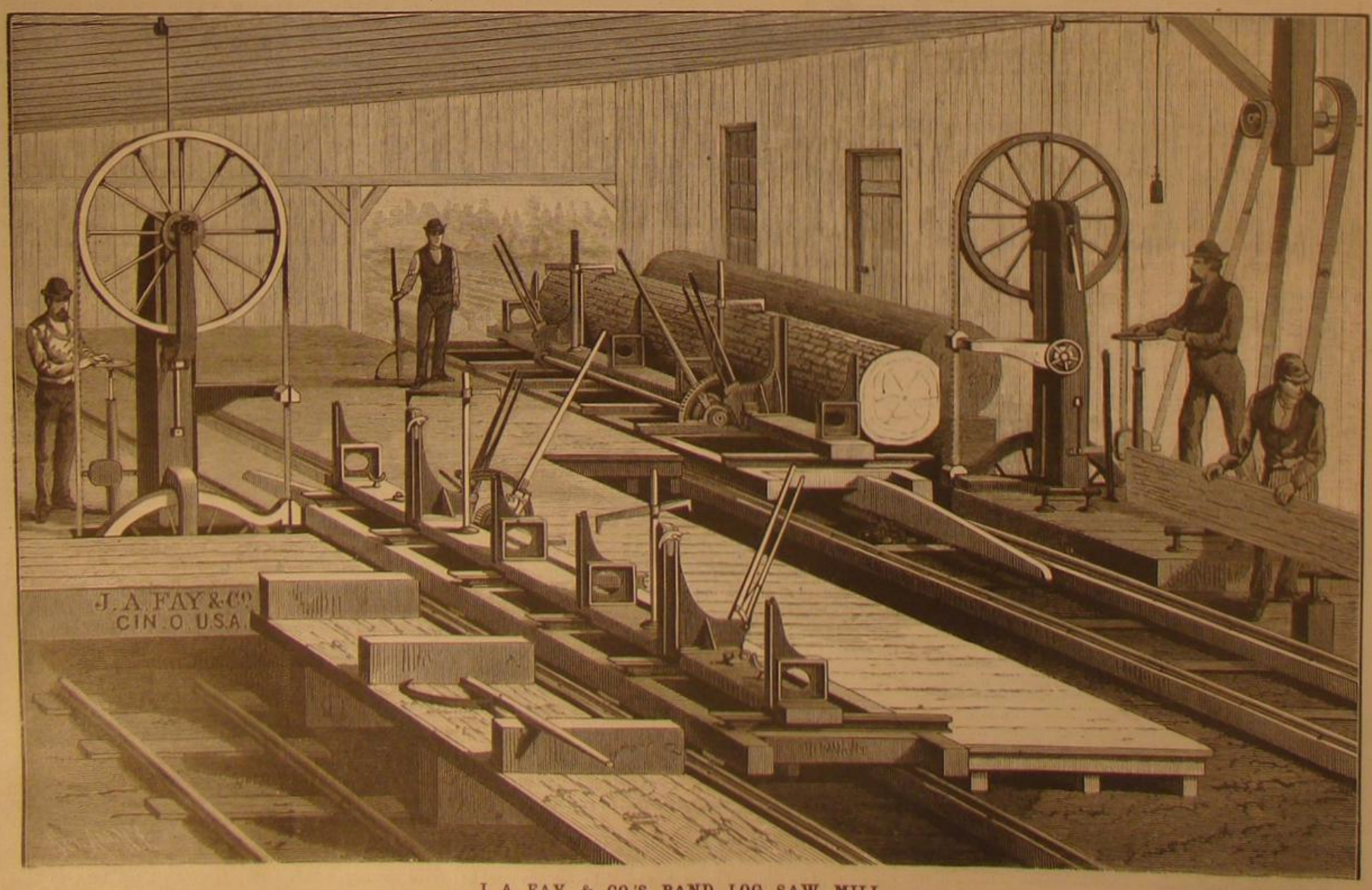
The carriage can be run close to the rear of the mill building. Every part is most thoroughly constructed, and the working parts are all readily accessible. The blade is usually four inches wide and No. 18 gauge, and removes a kerf of one-sixteenth of an inch.

The enormous saving in lumber over other saw mills by this machine we leave to our readers to compute, feeling it will be worth their most careful investigation.

Any further particulars can be had by addressing the makers, Messrs. J. A. Fay & Co., Cincinnati, Ohio.

Bring Out another Gun.

England has just finished a ram that is supposed to be almost invincible, the United States Government has been trying a torpedo that may blow the ram to pieces, and a Pittsburg man has been experimenting with a new breech-loading rifled cannon of unusual power. That old problem about what would happen if an irresistible force should meet an immovable body will yet be put to the test if inventors go on improving their guns, torpedoes, and armored vessels.—*Philadelphia Ledger.*



J. A. FAY & CO.'S BAND LOG SAW MILL.

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.

Remit by postal order. Address
MUNN & CO., 37 Park Row, New York.

The Scientific American Supplement

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

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

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

Scientific American Export Edition.

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

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

NEW YORK, SATURDAY, AUGUST 13, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural inventions 98
Alarm, torpedo steamer 96
Balance, simple a* 99
Bath box for photo. purposes* 99
Beans 98
Beer, the pasteurization of 98
Bells on sheep 106
Bending machine for iron, etc.* 98
Boiler explosion, Mr. Lawson's 97
Boiler, steam, notes 104
Boilers, button-set riveting for 96
Bottle, novel, a* 100
Bows and arrows, modern 101
Canning, pioneer 97
Carbon paper (2) 107
Catamaran, steam passenger, a 105
Coffee, Liberian 103
Comet, new, the 104
Condensed milk* 99
Copper ores, electro assay of* 99
Diamonds, paste 101
Dogs, sheep-killing, trap for 105
Dotterel, ill-fated, the 105
Engineering inventions 103
Eruption of Mauna Loa 106
Ether, solidification of 98
Evolution, Prof. Winchell on 102
Explosion, boiler, Mr. Lawson's 97
Fair, mechanics', in Boston 97
Floating, easy, secret of* 107
Food for infants 102
Fruit picker, novel* 102
Galvanization of an engine piston 97
Glass, to cut (1) 107
Gun, another, bring out 95
Halls, ventilation of 96
Honey, spurious, distinguishing 102
Hornets, how to come it over 106
Hudson, William S 97
Infants, food for 102
Inventions 106
Inventions, agricultural 98
Inventions, engineering 103
Inventions, mechanical 104
Inventions, miscellaneous 100
Inventions, new 102
Inventions, recent 105
Jetty lights 106
Levee building on the Mississippi 106
Locomotive, road 98
Locomotives, large, for the West 105
Magazines for coal stoves* 98
Mat, an ancient 103
Mechanical inventions 104
Milk, condensed* 99
Mosquitoes 106
Nitro, safety 105
Oil, striking, in Titusville 104
Poison, Italian antidote 97
Porcelain factory at Sevres* 103
Postage stamps 105
Prehistoric man, another 98
Pumpkin seeds, crystal album, in 99
Pump, steam, double-plunger* 102
Quebracho wood 103
Railroad accidents in June 98
Reel, hand, for silk, need of a 97
Riveting, button-set, for boilers 96
Robberies, car-safe, to prevent 100
Rubber, birch bark 100
Saw mills, band log, improved* 95
Sea sickness, a remedy for 100
Selenium cell, the 103
Sevres vase* 103
Silk mills in Philadelphia 105
Skull measurements 106
Steam boiler notes 104
Steel, hardening 106
Stoves, coal, magazines for* 98
Telegraph monopoly, growth of 102
Tobacco pipes, large collection of 101
Torpedo steamer Alarm 96
Transfer paper (2) 107
Trotting time, improvement in 102
Vase, Sevres* 103
Ventilation of halls 96
Whales, sperm, large schools of 100
Wood, quebracho 103

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 293,
For the Week ending August 13, 1881.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—Compressed Air Clocks. A full description of the system of pneumatic clocks lately inaugurated in Paris. Large illustrations. 1. Central Clocks, Pressure Regulator and Controlling Apparatus.—2. Great Air Reservoir.—3. Air Pumps.—4. Normal Regulating Clocks.—5. Receiving Clock. 4663
Boilers with Corrugated Flues. 6 figures. Boilers with Fox's corrugated flues 4665
Launch of the City of Rome 4667
Paper Pulp from Wood 4667
Oil Pressing Machinery. Ancient and modern methods of extracting seed oil. 12 figures. Oil machinery, and Wateringbury Oil Mill, Kent, England, with plan, sectional elevations, etc 4667

II. TECHNOLOGY AND CHEMISTRY.—Reduction of Overprinted Proofs 4670
To take Positives in the Camera Direct. By J. B. OBERNETTER. 4670
Fruit Syrups. By Dr. A. G. VOGELER. How to make and how to test fruit syrups 4671
Liquefaction of Gaseous Mixtures. By CAILLETET and HAUTEFEUILLE 4674
The Alloys of Manganese 4674
Society of Chemical Industry. Report of the first meeting of the society.—The President's address.—Prof. Charles Graham's paper on "Brewing of Lager Beer."—Siemens on the use of Coal Gas as a Heating Agent 4675
Estimation of Butter. By L. MEDICIS and S. SCHERER 4676
Detection of Phosphorus. By F. SELMI 4676
Elementary Chemistry for Brewers. Phosphorus 4676
A Delicate Test for Mercury. 1 figure 4677
On a Curious Actinic Phenomenon. By Dr. T. L. PHIPSON 4677

III. HYGIENE, ETC.—Common Sense Sanitation. By THEO. S. CASE.—Importance of personal cleanliness, household cleanliness, and municipal cleanliness.—Problems, methods, and suggestions 4666
Relation of Science to Speculation. By J. W. DAWSON.—What is life?—Theories of existence 4667
Are we Right Sighted? 4671
The Saw Palmetto.—Its remarkable dietetic and medical properties 4671
The Impurities in Water and their Influence upon its Domestic Utility. By GEO. STILLINGFLEET JOHNSON.—Important Society of Arts paper and discussion 4672
Hardness of Water. By V. WARTHA 4673

IV. ELECTRICITY, ETC.—An Electrical Speech Recorder 4669
Chemical Action in a Magnetic Field. By IRA REMSEN.—Part I.—On the deposition on copper of iron in a magnetic field 4675
Selenium as a Heat Regulator 4676
Terquem's Gas Burner. 1 figure 4676
Filtering Apparatus for Viscid Liquids. 1 figure 4676
Twisting Filter Press. 1 figure 4676

V. GEOLOGY AND NATURAL HISTORY.—The Niobrara Group.—The marvelous fauna of an ancient Nebraska (cretaceous) sea 4670
The Geology of Florida 4671
Chlorophyl.—Prof. N. Pringsheim's researches touching the functions of chlorophyl and hypochlorin in plants 4673
The Cat and its Relations. By F. A. LUCAS.—Methods of Classification.—The cat described.—Two great groups.—Fishes.—Amphibians.—Their transformation.—Reptiles.—Birds 4677

VI. ARCHÆOLOGY.—The Roman Villa near Brading 4670
The Ruins of Libydia 4670

VENTILATION OF HALLS OF AUDIENCE.

An able and exhaustive paper has lately been presented to the American Society of Civil Engineers, on the ventilation of halls of audience, by Mr. Robert Briggs, C.E. It appears from this paper that a man in health and at rest requires for breathing 480 cubic inches of air per minute. The inhaled air, in American summer condition of 70° Fah. and 70 per cent of hygrometry, or about 1·7 per cent of its volume of aqueous vapor, and 0·04 per cent of carbonic acid, will, when exhaled, be found to contain nearly three times as much vapor and nearly 100 times as much carbonic acid, and to have lost one-fifth of the oxygen inhaled, while the temperature will have risen to 90° Fah. But, contrary to the teaching of some authors, the exhaled air will be about 3 per cent lighter than it was before being breathed. The carbonic acid does not, as some believe, separate and fall to the ground, but it is inseparably mixed with the breath.

Breathing is not the only means through which inhabited air is vitiated; insensible perspiration adds one-fifth or more to the carbonic acid sent out with the breath, while an average of about two pounds of water per day evaporates from an adult man at rest and awake, and both add to the contamination of exhaled air.

Now, if it be accepted that air is unfit for breathing after having once been in the lungs, it seems that about one-third of a cubic foot of air per minute is required by each person. The internal temperature of the body being nearly 100° Fah., it is essential that the surface should radiate heat, and that the air thus heated should pass off. Small portions of ammonia and gases, with floating organic matter, dust, and smoke in the air, with the probability that the origin of disease is only found in the germs of living organisms that subsist on the decomposing organic matter suspended in the atmosphere, are important facts in estimating the quantity of air required for perfect ventilation. It seems, therefore, that at least four cubic feet per minute are required, and that this quantity would amply ventilate a single person if it could all be devoted to his use exclusively.

Passing now to the subject of practical ventilation of halls of audience, it appears that each individual of an audience cannot, by known means, be supplied with his quota of four cubic feet per minute, which would, if made to pass upward along his person while standing, serve to perfectly ventilate him; it further appears that in a room continuously occupied by persons in health, or at least not affected with offensive diseases, as much as 30 cubic feet of air per minute must be properly introduced for each individual. A desirable capacity for the chamber seems to be 1,000 cubic feet of room for each person, but audience halls average no more than 200 to 300 cubic feet to the person, and therefore contain only about six to ten minutes' supply of air. This smaller capacity does not seem to be a very important defect, provided a systematic supply of air, at a proper temperature and in a desirable state of humidity, is properly introduced and distributed. The last part of the problem, as here stated, is the important difficulty to be overcome.

The system of air introduction through perforated floorings is in operation, and has been for twenty-four years, at the Houses of Parliament, London, although it is thought to be "embarrassed in its action by singularly unmechanical and insufficient apparatus for warming and supplying the air."

In other systems the standing difficulty is the establishment of local currents which produce unpleasant sensations in those persons who are exposed to them, and the desideratum has been and still is to supply an effective quantity of agreeably tempered air in such a way as to be imperceptible to the audience.

As regards the comparative effects of gas and electric lighting we are told that "the vitiation of air by electric light, arising from the slow combustion of the carbon, is too insignificant to form any element in considering the ventilation." The ventilation of churches that are heated by furnaces in the cellars beneath the audience can be partially done by removal of air at or near the floor, but no large ventilating shaft from the upper part of the room is admissible as a means of natural ventilation.

Natural processes can be only partially successful in ventilating audience rooms. Success "can only follow the complete adaptation of mechanical appliances and apparatus, as well as of structural arrangements, to the ascertained wants and requirements of the individual composing an audience."

Fans of the disk pattern are recommended as being from 10 to 15 per cent more effective than the common incased fan. The speed of the fan should be such as to impel the air in the ducts at the rate of 600 feet per minute, while the ends of the ducts should be fitted with baffling boxes so that the air may leave the box at a velocity not exceeding 120 feet per minute at a distance of one foot above it.

Box coils, as they are called, consisting of horizontal pipes inclosed in a chamber, are best for indirect heating (ventilation); while vertical coils, though less efficient by 20 per cent, are preferable for office heating.

The efficiency of well exposed steam pipes with steam at 36 to 40 pounds pressure is given as 3 cubic feet of air heated from zero to 100° Fah. per square foot of surface, or 5 cubic feet from 50° to 70° or 80°.

For direct heating by coils placed in the rooms to be heated one square foot for each 80 cubic feet of space within the walls of an exposed room, but special provision must be made for doorways and open passages.

The cross section of steam supply pipes should have one circular inch area for every 500 feet of effective heating surface, enlarged $\frac{1}{10}$ for each foot from the point of first distribution or branch from the main. The condense water or return requires one half as much. Flow mains should rise vertically to some point where they can be drained or trapped, and then descend half an inch in 10 feet to the end.

Boilers of the common tubular form require one square foot of heating surface to each 9 square feet of coil surface or radiators, or one square foot of grate surface to 270 of radiating surface, the grate and heating surface of the boiler being as 1 to 30.

Chimney flues 50 feet high should have an area one-tenth of the grate surface, and 100 feet high one-twelfth. The maximum quantity of coal consumed will not exceed 8 pounds per square foot per hour, while for six months in the year 20 to 30 pounds per 24 hours per square foot will suffice.

A fan delivering 20,000 to 40,000 cubic feet of air per minute will require from 20 to 60 pounds of coal per hour. No allowance need be made for steam to drive the fan where buildings are warmed and ventilated, as the exhaust steam will be utilized for heating purposes.

The author says, "steam heating apparatus in all its details, as used in America, is peculiarly American," and "as practiced here, is not fully known or used in England or France, and but little more known in Germany."

BUTTON-SET RIVETING FOR BOILERS.

"Button-set riveting," which means forming the zone of a globe on the rivet by means of a concave "set" and a sledge, has been generally regarded with disfavor by boiler makers, but it has been long used by oil tank builders, enabling them to erect large tanks with astonishing rapidity and at correspondingly low cost for labor. The fine appearance and general good character of this work led enterprising boiler makers, who were not in condition to warrant the expense of steam riveting machines, to clandestinely try this method on steam boiler shells, and it has at last found favor among reputable makers, who now employ it openly, and they are supported in it by most people who understand the difference, except perhaps professional hand riveters, whose occupation is injured by its adoption.

We take the following from an interesting report by Mr. Wells to the recent convention of Railroad Master Mechanics at Providence, on the subject of "set riveting," as compared with "steam" and "hand riveting" of locomotive boilers. The plan of "set" riveting consists in placing upon the inserted hot rivet a set, mounted upon a handle, as smiths' sets, flatters, and hot chisels are, and having a cavity of the shape and dimensions of the desired head in its lower end, and "driving" the rivet by strokes from one or more sledges upon the other end of the set, a heavy holding iron being used to meet by its insertia the force of the sledges. The weight of the set described is 2½ to 3 pounds, of the sledges 9 to 10 pounds, while the holder or anvil placed upon the other end or head of the rivet is about 60 pounds, and held firmly against the work by the short arm of a stiff lever of the first order.

The skill required for this work is readily acquired by laborers of ordinary intelligence, and consists merely in properly placing the holder, holding the set squarely on the rivet, and delivering fair blows upon its upper end. The first blows serve to upset the body of the rivet in the hole more effectually than blows struck with light hammers directly on the rivet point, and 24 blows in all, at the rate of about 80 per minute, finish the "setting" of the rivet, and half a dozen blows upon a "flatter" placed on the lap near the rivet completes one rivet, except a few blows more on the set to give the head a nice finish according to the taste of the workman.

Thus are driven on the shell of a boiler 30 rivets per hour, or an average of 22 on all parts, including changing bolts, drifting holes, and adjusting the work. Hand riveters average about 125 rivets per day of twelve hours and a half, or 10 per hour, under similar conditions. The report shows that the riveting of a locomotive boiler containing 1,722 rivets will occupy 65·85 hours, at a total cost for labor of $44.77, or an average of 2·64 cents each rivet, against which stands 5·84 cents each for rivets driven by hand at the rate of 10 per hour. The difference in favor of set riveting is shown to be 54 per cent in cost and 51 per cent in time. From the drawings exhibited, showing sections of laps riveted by the two methods as well as by steam riveter, it appears that "set" riveting is the most perfect in the matter of the rivet filling the hole. The remarks by members that followed the report indicated that no discussion was possible, since all seemed to think favorably of this method, and the president of the convention thought, that being the case, it ought to be adopted at once.

THE TORPEDO STEAM ALARM.

For several days the torpedo steamer Alarm has been stationed at Yonkers, on the Hudson, where trial has been made of the new propelling and steering machinery with which she has been fitted.

This vessel, and the novel system of torpedo warfare provided for in her construction and equipment, were described and illustrated in detail in the SCIENTIFIC AMERICAN of March 17, 1877. The Fowler wheel, which had been adopted to fill the double office of propelling and steering, did not prove entirely satisfactory. It enabled the boat to turn quickly in small space, but it did not give speed enough.

Accordingly an appropriation was made by Congress to change the driving machinery, and the Mallory propeller was substituted. The tests now being made are chiefly to determine the efficiency of the new system. With the Fowler wheel but seven knots were made. With the Mallory propeller a speed of eleven knots has been attained, two of the four boilers being used, and her commander, Lieut. R. M. G. Brown, expresses the opinion that twelve knots can easily be accomplished—in plain English, about two thirds the speed a vessel of this character ought to have to make her effective against modern war vessels.

As a steering apparatus the propeller is evidently a success. The vessel can be stopped without reversing the engine, and can be made to spin as upon a pivot. Whether the lack of speed is due to the plan of the vessel or to lack of power in the propeller does not appear.

The Alarm is 172 feet long, including a 32 foot ram. Her beam is 26 feet 6 inches, and drawing 11 feet of water she displaces about 700 tons. She is intended to fight bows on, and in addition to her ram and torpedo equipment she carries one large gun in the bow. It is an ordinary 22 ton smooth-bore. The Alarm is intended chiefly for coast defense, and if her speed were increased fifty per cent., and her cannon changed to a heavy breach-loading rifle, she would be really formidable. Her torpedo equipment appears to be entirely satisfactory.

MR. LAWSON'S BOILER EXPLOSION.

BY S. N. HARTWELL.

In the year 1835, at the request of the Secretary of the United States Treasury, a series of experiments was undertaken by a committee of the Franklin Institute to ascertain causes of unexplained boiler explosions. A small plain cylinder boiler, set in brick, having in each of its flat cast iron heads a small glass window supported by a metal grating, through which to observe the effect of certain manipulations that were supposed to contribute to destructive boiler explosions.

The first experiment was "*to ascertain whether, on relieving water heated to or above the boiling point from pressure any commotion is produced in the fluid.*" In the report of the committee on this experiment is the following:

Experiments were made which showed that on making an opening, even when the pressure did not exceed two atmospheres, a local foaming commenced at the point of escape, followed soon by a general foaming throughout the boiler, the more violent in proportion as the opening was increased. This small boiler (12 inches diameter by 34 inches long, half full of water) "was completely filled with foam by opening the safety valve, which was placed in the middle of the top, and the water violently discharged through the opening of the valve." In regard to the effect on the gauge, they say "the gauge fell always on making the opening."

The committee used also fusible disks of much larger area than the safety valve, by which, on fusing, an aperture 0·95 inch in diameter was suddenly opened. The effect even at low temperatures was the violent discharge of the scalding contents against roof of the boiler house.

A number of experiments followed until the water was entirely exhausted, and the boiler was allowed to attain a red heat, and trials were repeated by injecting water directly upon the hot surface. They say "the result was uniformly a diminished elasticity of the steam."

The interesting and valuable experiments of Mr. Daniel T. Lawson, of Wellsville, recently made and described in vol. xlv., No. 2 (July 9), of the SCIENTIFIC AMERICAN, seem to be a supplement to those of the Franklin Institute made 46 years before, and they add one more to the practical demonstrations of theory.

Probably no well-informed engineer who has given the subject proper attention doubts that Mr. Lawson's experimental boiler would explode as described on suddenly letting out the steam through a two-inch pipe, when the pressure had risen to 380 pounds per square inch. The questions that arise in this connection Mr. Lawson may not be able to answer until more experiments are made. The estimated strength of his boiler being, as he says, about 600 pounds to the square inch, at what steadily increasing pressure under his practical conditions would it have exploded had no shock been produced by the artificial means applied to liberate the steam? And at what pressure would it have given way under conditions of the cold hydrostatic test? At 350 pounds pressure his first experiment failed to explode the boiler, while it did explode at 380 pounds on a second trial. How many shocks equal to the one produced in the first trial would have sufficed to explode the boiler? And how many would have destroyed the boiler? And with what proportional results at lower pressures, say down to practical every-day examples of boilers supposed to be working under one-fifth their breaking load? The term superheated, used by Mr. Lawson in describing his experiment, is, however, calculated to mislead those who are not familiar with boiler temperatures. Water that discharges steam from its surface, or boils under a pressure of 380 pounds per square inch, has a temperature not far from 440° Fah., about the melting point of tin. But according to the accepted meaning of the term this water is not superheated. Its temperature is normal to the conditions, the same as 212° is to conditions of atmospheric boiling.

Superheated water is that having a temperature higher than the boiling point at the given pressure; but to bring it into this very unstable condition experimentally requires very delicate manipulation. Professor Douny, of Ghent, many years ago succeeded in doing so, but it is probable that nine out of ten of his imitators have utterly failed in their attempts to prevent circulation of the water and to exclude air and other impurities. Heat applied to a limited surface of a steam boiler invariably induces circulation, a condition destructive of the desired effect. Perfectly still and perfectly pure water, perfectly deaerated, may be superheated so that a slight disturbance will cause explosive ebullition. But pure deaerated water in motion is not explosive unless the pressure is suddenly removed from its surface, when a sudden escape of contained heat, causing violent action, is the result of the lowering of the boiling temperature. Thus water at 212°, if suddenly introduced into a vacuum, will practically explode, and for an instant fill the vessel with a heavy foam, which will again mostly become "solid water" as soon as its temperature falls to the boiling point under the new condition of pressure. The greater the change of pressure suddenly effected the greater, of course, will be the shock of the disintegration or explosion of the water. Probably a correct estimate of the velocity of the flight of the water at 440° Fah., every particle of which is, in regard to the new condition, surcharged with heat, and springs with lightning speed, would show that the explosive action very nearly resembles that of a fair quality of gunpowder.

In regard to one of the questions suggested above the late experiment in the boiler yard of Sidebotham & Powell, in Philadelphia, an account of which was published in the SCIENTIFIC AMERICAN of July 23, 1881, may be considered another of those valuable practical things that form a common-sense basis for determining the strength of modern structural material, and it throws light on the subject of boiler explosions, which will no doubt dispel some of the vapors that have been raised around the late occurrence at Gaffney's dyehouse. We need more of this sort of thing and less theoretical prediction.

PIONEER CANNING.

BY H. C. HOVEY.

The first successful attempts at canning fish, fruit, and vegetables were made at Eastport, Me., about the year 1840. The honor of this pioneer work (as I am informed by Mr. D. I. Odell, British Vice Consul, Eastport, Me.), is to be shared between Mr. Charles Mitchell, who brought the idea with him from Scotland, and Mr. U. S. Treat, who employed him and furnished the requisite capital to carry on experiments. After working for Treat four or five years, Mitchell was associated with a Mr. Underwood for thirty-six years in canning lobsters at various points from Portland to the Gulf of St. Lawrence, and finally settled down at the Grand Manan.

The original Eastport firm, formed in 1841, was "Treat, Noble & Haliday." At first they canned salmon, clams, and lobsters. Then they put up, in a similar manner, beef, mutton, fowl, corn, etc. At one time large quantities of ox-tail soup were thus hermetically sealed and sent to market. To supply the material ox-tails in great numbers were brought on from Boston to Eastport in crates.

When the firm broke up, which it did in 1844, Noble went to St. John, N. B., and Haliday to Halifax, N. S., each to engage in the fish business. But Treat kept on canning. He bought an island, that bears his name, in Passamaquoddy Bay, where, besides the business already mentioned, he established a large trade in smoked herring, fish oil, and fertilizers, having a steam mill for the purpose. He made heavy shipments, principally to ports in Connecticut. It is satisfactory to our sense of justice to know that each member of this enterprising firm amassed a competent fortune, and enjoyed a fair share of public recognition.

Mr. Treat's superior knowledge and experience becoming known to Hon. S. F. Baird, of the Smithsonian Institution, the latter secured for him an appointment in Japan, at a salary of $5,000 a year, to develop the fishing and canning enterprises of that empire. There he remained for three years, at the expiration of which period he removed to California; where, at the advanced age of seventy-five years, he is associated with his two sons in his old business of canning salmon.

When Mr. Winslow Jones, of Portland, had his celebrated law suit, some years ago, with certain parties in Chicago, who, as he claimed, had infringed on his patent process of canning corn, the defense summoned Mr. Treat as a witness to prove that the process had been in use long before the Winslow patent had been procured.

It is also claimed for Mr. Treat that he originated the canning of oysters at Norfolk, Va., being employed by dealers for that express purpose.

The canning of various products, chiefly marine, is still extensively carried on at Eastport. What is known as "The Eastport Packing Company" is mainly engaged in putting up lobsters, which are caught in immense quantities from Cutter to Point Lepreau. They pack only the claws and tails, grinding up the bodies and shells for use as a fertilizer; thus wasting nothing. One hundredweight of live lobsters, costing the company but one dollar, will make eighteen one pound cans, selling in New York at one dollar and a half per dozen.

Men who learned the art of canning in what is geographically, but not otherwise, "the last town in the United States," conveyed the mysteries of the business to the remotest portions of the land; until now the trade in canned goods has become one of the most lucrative and important branches of industry in America, furnishing employment for thousands of people.

GALVANIZATION OF AN ENGINE PISTON.

Mr. P. Paul, an engineer, makes known through the columns of our French contemporary, *Le Genie Civil*, a curious accident which happened in 1880 in the shops of Fleury's Boiler Works at Cette. The feed water of the steam generator depositing a large amount of incrustation, Mr. Fleury was advised to throw into the boiler fragments of zinc, the disincrusting property of which is well known. After a few days the motor, notwithstanding its frequent lubrication, began to work with difficulty. The iron piston griped strongly, and before long it became almost impossible for the engine to work at all. On taking the mechanism apart to examine into the cause of the trouble the piston was found to be coated with a heavy layer of copper, which, upon turning the piston in a lathe, was found to be thickest in those parts that had been submitted to friction.

The explanation offered by Mr. Fleury is quite plausible. The boiler was connected with the engine by copper pipes. The particles of zinc carried along by the steam constituted, then, with the metal of the pipes, an infinite number of small galvanic couples; hence the transportation of the copper by the piping to the piston, which principally attracted it because of its continual motion exerting an attraction as a mass upon the molecules, the fixation of the latter being facilitated by the heating produced by friction.

Mechanics' Fair in Boston.

From the statement of Mr. Charles Slack, at a recent meeting of the Massachusetts Charitable Mechanics' Association, it appears that its various enterprises are getting on well, and that the mason work on the new exhibition building, which was begun on March 1, is now completed, and goods will be received as per programme. It is arranged that among the other interesting exhibits there will be one of special interest by "the Boston Manufacturers' Mutual Fire Insurance Company. They will exhibit a large collection of apparatus for saving and protecting property at fires, and of articles which have been through fire. Small brick structures will be erected outside the building for the practical trial of some fire-proof materials. Altogether, the managers of the exhibition are well satisfied with the prospect."

William S. Hudson.

William S. Hudson, locomotive engineer and inventor, died at his residence near Paterson, N. J., July 20. Mr. Hudson was born in Derbyshire, England, and served his apprenticeship with Robert Stephenson, builder of the "Rocket." Soon after coming to this country he was employed to begin the manufacture of locomotives at the Auburn State Prison, but the project failed for lack of competent workmen. Mr. Hudson then became master mechanic of the Attica and Buffalo Railroad, afterwards merged in the New York Central.

In 1852 he removed to Paterson, to take charge of the Rogers Locomotive Works. Very many important improvements in locomotive construction are due to Mr. Hudson's skill and inventive faculty.

The Need of a Hand Reel for Silk.

Some months since the attention of inventors was called in this paper to the growing need of a light hand reel for unwinding silk cocoons. The president of the Women's Silk Culture Association (1328 Chestnut street, Philadelphia) informs us that the demand is still unsupplied and urgent. A rough model of a reel is now at the rooms of the association, and inventors are desired to develop the idea of it into a satisfactory machine. A large number of persons have taken up the work of raising worms, and a proper reel for unwinding the cocoons would meet with a ready and growing sale. The reel should have a wheel 72 inches in circumference, and should be compactly built. It must also be inexpensive to meet with favor from the class now becoming interested in the culture of silk.

The association has established a school for teaching the art of raising and feeding silk worms, and they believe that if the industry were properly introduced silk culture would not only prove of great importance to our manufacturing interests but would furnish remunerative employment to thousands of poor families, particularly women. The demand is chiefly for reeled silk, and the lack of a suitable hand reel is the only drawback to the good work.

Italian Poison Antidote.

M. Bellini, of Florence, advocates the use of iodide of starch as an antidote for poisons in general, and, as it has no disagreeable taste and is free from the irritant properties of iodine, it can be administered in large doses; also, without fear in all cases where the poison is unknown. It will be found very efficacious in poisoning by sulphureted hydrogen gas, the alkaloids and alkaline sulphides, ammonia, and especially by alkalies, with which iodine forms insoluble compounds; and it aids in the elimination of salts of lead and mercury. In cases of acute poisoning an emetic is to be given before the antidote is administered.

IT is reported that a considerable deposit of specular iron ore has lately been discovered near Acworth, Ga. It is said that scientific men pronounce it to be of high grade, free from phosphorus and sulphur, and strongly magnetic, while the bed is well located for treatment of the ore on the premises, as well as convenient for shipment to market.

AGRICULTURAL INVENTIONS.

An improved seed planter has been patented by Mr. Julius Holekamp, of Comfort, Texas. The object of this invention is to improve the construction of the seed planters for which Letters Patent No. 236,223 were issued to the same inventor January 4, 1881, in such a manner as to make them simpler in construction and more convenient and effective in use.

An improved potato assorter has been patented by Mr. Charles O. Morris, of Trenton, N. J. This device is intended for assorting potatoes into two or more grades. It is simple and effective.

An improvement in horse rakes has been patented by Mr. Sam T. Ferguson, of Minneapolis, Minn. This invention relates to certain improvements in horse rakes of that form in which curved spring teeth are attached to the rake head, and the latter is rocked on its journals to dump the rake by being drawn forward by a link attached to the lower bent end of a hand lever.

Solidification of Ether.

It is a curious fact that, for a long time, chemists pronounced the solidification of ether an impossibility. Even so great an expert as Thénard, after repeating the unsuccessful experiments made by Fourcroy and Vanquelin, found that ether still remained liquid even when submitted to the intense cold represented by 99° of the Centigrade thermometer. More recently, Franchimont has proved that, though Thénard's assertion is correct as regards pure ether—or what is termed anhydrous ether or absolute ether—the results are very different when the ether contains, as is very frequently the case, a certain quantity of water. Thus, it appears, ether that contains a little water, but no alcohol, produces small crystals when submitted to a temperature of 31°, and, as the cold increases, these crystals do not augment in size or quantity; they are simply crystals of ice.

Another Prehistoric Man.

Some human remains, evidently of great antiquity, says the *Academy*, were discovered a few months ago at Carabacel, near Nice, and have been reported upon by a local scientific committee, as well as examined by M. de Quatrefages. The bones had not been artificially interred, but were found embedded in a deposit of calcareous clay, at a depth of about nine feet from the surface. This deposit was irregularly stratified, and contained a mixture of pliocene and eocene shells, showing that it had been formed by the reconstruction of the pre-existing strata. Of the bones the most remarkable is the lower jaw. This is sufficiently characteristic to enable De Quatrefages to refer it to the Cro-Magnon type. The fossil man of Nice, therefore, belongs to the same race as M. Riviere's skeleton from Mentone, both being probably of Paleolithic age.

BENDING MACHINE FOR IRON AND STEEL.

We give an engraving of an improved bending machine made by Messrs. Williams, White & Co., of Moline, Ill. It is intended for bending iron or steel bars or plates between dies. The variety of shapes that may be bent on this machine is practically without limit. It is adapted to agricultural, railroad, and engineering work, and in many operations it may replace the drop press. The dies may be very readily changed, and the work is easily placed and removed. It is rapid in its operation, and effects a great saving in labor.

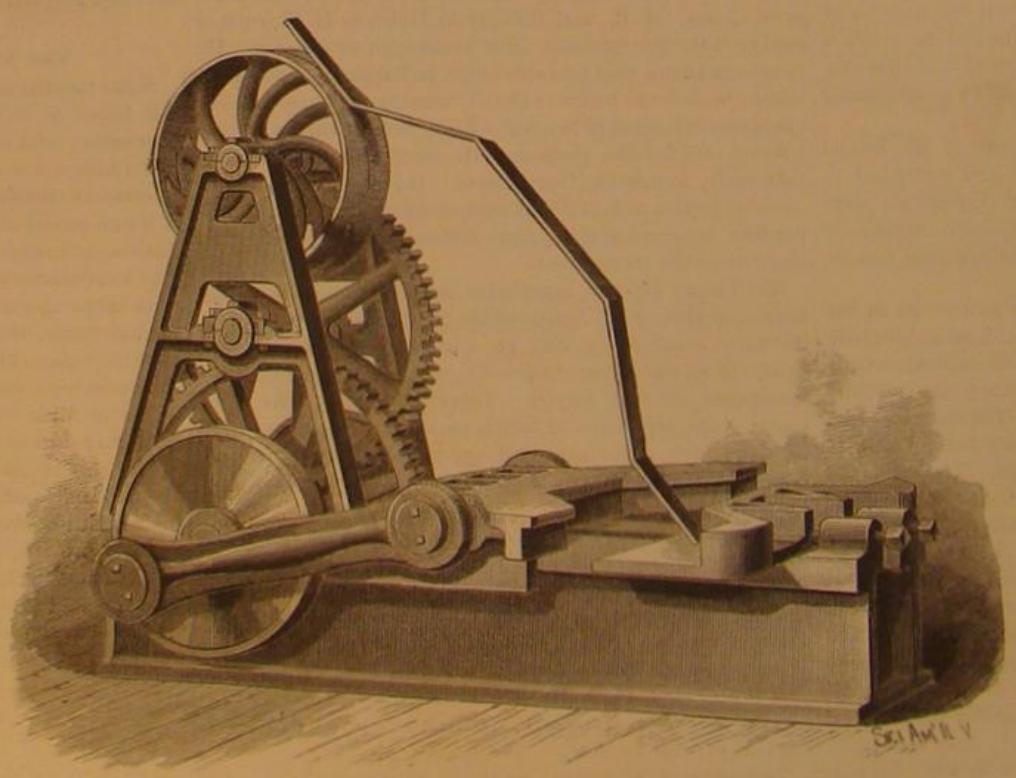
The operation of the machine can be readily understood by reference to the engraving.

The crosshead carrying the movable die is reciprocated by the cranks, which are moved by a train of gears driven by a belt from the line shaft or other source of power.

The crosshead moves seventeen inches and makes one stroke while the tight and loose pulleys make eight revolutions, thus giving the dies very great power over the work.

The particular dies shown in the engraving are for bending the arches of freight car trucks.

The machine is highly recommended by a large number of agricultural manufacturing works, and is in use, giving entire satisfaction, in several engineering works. Further information may be obtained by addressing Messrs. Williams, White & Co., Moline, Ill.



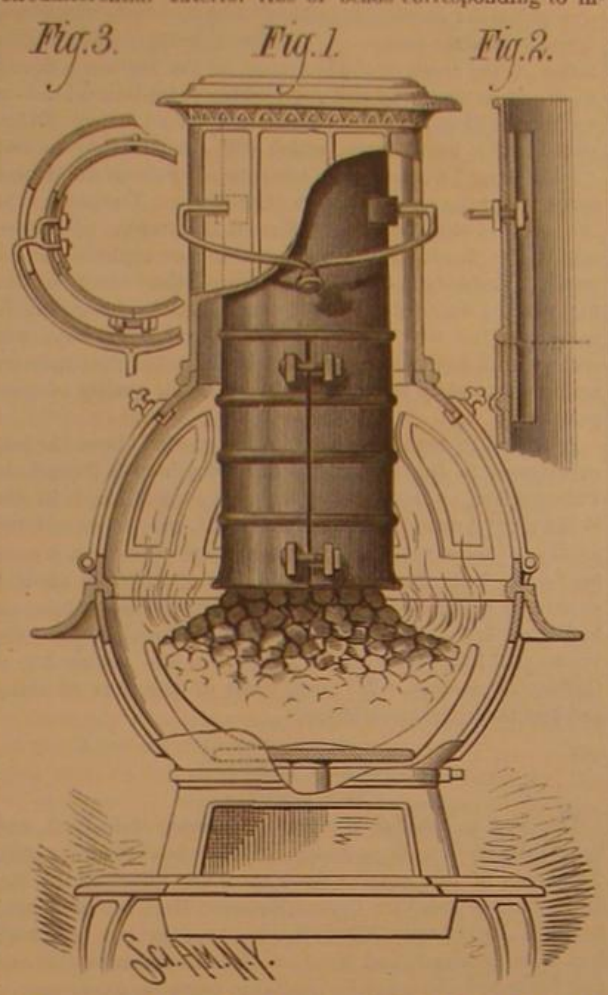
WILLIAMS, WHITE & CO.'S BENDING MACHINE.

Road Locomotive.

A road locomotive for war purposes, constructed by Bolle, was recently tried in presence of Count Moltke and several other authorities. The machine drew five guns with their carriages completely equipped, the load amounting to 800 cwt. The journey lasted about three hours and a half, with one halt. The locomotive itself weighed 575 cwt., and it is capable of drawing 3,000 cwt. The expense is about two marks an hour. The velocity was equal to that of a troop of infantry, but might be much increased.

EXTENSION MAGAZINES FOR COAL STOVES

The engraving shows an improvement in magazines for coal stoves, recently patented by Mr. Dewitt Van Evera, of Maquoketa, Iowa. The invention is intended to facilitate the use of different kinds and sizes of coal in the same magazine, and to insure the proper feed of the coal to the fire box. The improvement consists in forming, upon the lower portion of the stationary part of the magazine, a number of circumferential exterior ribs or beads corresponding to in-



VAN EVERA'S EXTENSION MAGAZINE FOR COAL STOVES.

ternal grooves in the movable portion of the magazine, so that the latter can be moved up or down, so as to lengthen or shorten the magazine, and permit of a greater or less depth of fire *in* the fire pot of the stove. The movable part is made in two halves and fastened together with bolts, so that it may be readily separated and adjusted to any desired height.

By means of this construction the stove may be regulated for burning different quantities of coal for apartments of different sizes, or for different seasons of the year, thus avoiding the necessity of changing from one size of stove to another, and in fact adapting one sized stove to a wide range of requirements.

This magazine has an attachment for loosening the coal, so that it will readily pass down into the fire pot. This part of the invention is clearly shown in Figures 2 and 3, which are respectively and vertical horizontal sections of the magazine.

The device consists of two curved plates, suspended on opposite inner sides of the magazine from a curved horizontal bail, which is provided with a handle extending through the front of the stove. By oscillating this bail the curved plates are moved so as to dislodge the coal should it become clogged.

The different sizes of stoves are commonly made and graded or adapted to particular sizes of coal, and each has a particular capacity which cannot be greatly varied; and when it is attempted to increase or diminish the capacity of the stove by dampers alone, gas is liable to escape and explosions frequently occur. The invention shown in our engraving obviates all this.

The advantages of these improvements will be apparent without further description. Any one having had much experience with coal stoves can readily see that the invention is based on sound common sense.

Beans.

M. Pauchon has made a series of experiments with beans, on the influence of the color of seeds on germination. He finds, in order to reach the same visible stage of development, a black or violet seed absorbs more oxygen than a white or yellow one, though a more rapid germination is observed in the latter. On the other hand, the quantities of carbonic acid exhaled by white seeds are found to be greater than those from the dark, sometimes even double. These differences are considered to prove that dark or violet seeds are better conditioned from a physiological point of view. In the natural state, that is, when the seeds germinate in light, the conversion of legumin into asparagin must go on much more easily in the colored seeds than in the others. "The more frequent and pronounced pigmentation of seeds of northern lands is, therefore," says M. Pauchon, "a favorable circumstance for the growth of these organisms, under the peculiar light conditions to which they are subject."

Railroad Train Accidents in June.

There was, according to the *Railroad Gazette*, a total of 73 train accidents in the United States, in the month of June, 1881; thirty-one persons were killed and seventy-eight injured; 20 accidents caused the death of one or more persons; 17 caused accident, but not death, while in 36 cases, or 49·3 per cent of the whole number, there was no injury to persons recorded.

The Pasteurization of Beer.

As far as we are aware, this method of preserving beer has not yet been practically applied in this country; this is the more surprising when we consider the enormous quantities of beer that are exported from this country, the value of which depends on its power to resist the changes produced by ferments under the influence of high temperatures, such as are found in many parts of the world where English beer is shipped to. When Pasteur made his grand discovery that the various fermentative changes in saccharine fluids are due to distinct organisms, each kind producing distinct and characteristic products, he also offered practical suggestions for the preservation of fermented fluids by destroying the organisms which produce the deleterious changes. The most serious results are produced in beer by the lactic and acetic ferments, and Pasteur suggested that beer might be preserved indefinitely if these ferments could only be destroyed or rendered inactive. Experiments in this direction proved that a temperature of 140° Fah. is sufficient to kill nearly all the lactic and acetic ferments, especially in the presence of a quantity of alcohol, such as is found in beer. It seemed, then, that for the practical application of this idea, all that was required was to raise the beer for a short time to the above temperature, but there are many difficulties in the way of carrying this process out. The beer must be inclosed in a hermetically-sealed vessel, otherwise there will be a loss of carbonic acid gas, as well as of alcohol and hop aroma; therefore nearly all attempts at pasteurization of beer have been made on beers in bottle. The usual method of proceeding is to place the well corked bottle of beer in a vessel of water the temperature of which is gradually raised to about 140° Fah., and the bottles of beer are maintained at this temperature for about fifteen minutes. There ought to be no difficulty in carrying this process out, the chief risk being in the bursting of the bottles, which cannot be prevented entirely. The pasteurization of beer has been carried out on a large scale by several Continental and American brewers, and successful results have been obtained. In order to obviate the breakage of glass bottles, it would seem preferable to heat the beer in bulk in a large hermetically closed metallic vessel, and subsequently, if necessary, to transfer it to bottles-taking care to prevent all introduction of germs during the bottling process. Our export beer trade is unfortunately not sufficiently flourishing for us to neglect any point which gives the foreigner an advantage, and in the matter of the pasteurization of beer many foreign brewers are decidedly in advance of us.—*Brewers' Guardian.*

A SIMPLE BALANCE.

The want of an inexpensive balance, sensitive enough to weigh very small quantities of matter accurately, frequently makes it impossible for those of slender means to engage in assaying or any quantitative chemical work. The simple and easily constructed contrivance described below will supply this want. With a little practice and care weighings can be made on it that will compare favorably in point of accuracy with the more elaborate and costly analytical or assay balance.

The hollow pillar, A (Fig. 1), is made of strips of perfectly dry, light wood, three-eighths of an inch thick, two inches in width, and twenty-eight inches in length, smooth finished inside and out, and joined at the edges and secured with screws. It is firmly fixed in a perpendicular position on the heavy wooden base, B, by mortising. The square wooden rod, C, thirty inches long, is planed and smoothly finished so as to snugly fit and slide easily in the hollow pillar, the screw, D, serving to hold it securely in any position.

A strip of good plate glass mirror, two inches wide and twenty-eight inches long, is secured in position against the face, F, of the pillar, A, by small brass bands at top and bottom. The slide, *b*, of thin, hard brass, one inch wide and three and a half inches long, is bent so as to slightly pinch the sides of the pillar and be moved easily up and down before the mirror. A spring, *a*, of fine hard brass wire is suspended before the mirror from a brass pin or screw, E. From the bottom of this spring is suspended a slender wire three inches in length, in the middle of which is fastened a small white bead, *c*. A scale pan, one and a half inches diameter, preferably of nickel-plated brass, is attached to the end of the wire. The base, *b*, may be secured by screws to a table. The mirror surface should be as nearly perpendicular as possible.

The method of using the balance is as follows: The substance to be weighed is placed in the scale pan, and the rod, C, is drawn up until the tension of the spring is sufficient to suspend the pan with its load before the mirror. As soon as the vibrations cease the eye is brought on a line with the top of the white bead, *c*, and its reflection in the mirror, as in Fig. 2. The slide, *b*, is then moved up until its upper edge just touches the line of vision between the bead and its reflection without disturbing the slide, *b*, the substance is then transferred from the scale pan, and small standardized weights put into its place until sufficient weight has been introduced to bring the bead again fairly on a line with the edge of slide and reflected bead. The weights in the pan correspond to the weight of the substance.

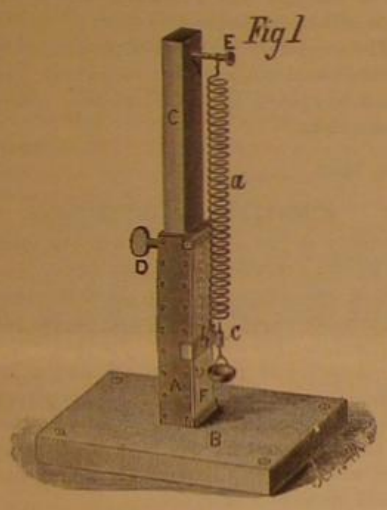


Fig 1

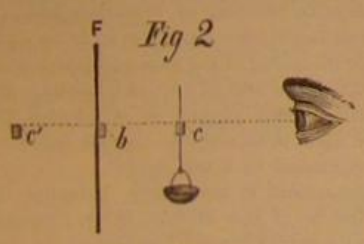


Fig 2

A SIMPLE BALANCE.

If the spring is gently handled in changing the substance for the weights no appreciable change takes place in its tension, but to avoid any chance error it is best to return the substance to the pan after the weights have been removed, and note if the bead returns to the first position marked by the slide.

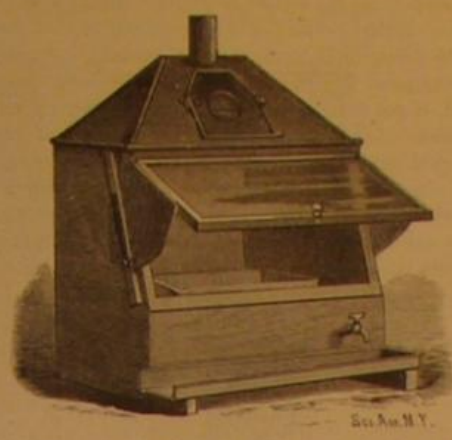
In making these weighings the weights should be put into the pan as soon as the substance is removed, and *vice versa*, no interval being allowed.

This balance is not intended to weigh a greater quantity of any substance than thirty grains, though with stronger wire spring it can be made to weigh ounces nearly if not quite as accurately as an ordinary balance. The rod, C, can be made to move smoothly if it sticks by rubbing it with a little powdered talc or soapstone.

CRYSTALLINE ALBUMEN IN PUMPKIN SEEDS.—Pumpkin seeds contain an albumen which may be easily obtained in well developed octahedral crystals. The proteine contained in the seeds consists chiefly of such crystals. Crystalline albumen is distinguished from the amorphous variety by a far smaller proportion of ash and of phosphoric acid, and by a higher proportion of carbon, nitrogen, and sulphur.

VENTILATED BATH BOX FOR CHEMICAL AND PHOTOGRAPHIC PURPOSES.

Every photographer knows or ought to know the exceedingly poisonous character of the fumes rising from the cyanide of potassium bath used in fixing photographic negatives and ferrotypes. These fumes are nothing more nor less than prussic acid, the most subtle and deadly poison known. Usually the poison is so diluted with air as to be very slow in its operation. Nevertheless it acts continually



MACURDY'S VENTILATED BATH BOX.

on the operator, gradually undermining his health, producing premature decline. The engraving shows a compact and efficient device for avoiding all this by inclosing the cyanide bath in a small box provided with a ventilating tube communicating with the external atmosphere.

The box is provided with glass sides, one of them forming a door which can be opened or closed at pleasure. When open it forms a hood, which prevents the fumes from escaping into the room, while it admits of viewing the plate as it lies in the bath.

The invention will be readily understood by reference to the engraving, and it will be appreciated by all photographers. It is a thing that has been needed, and should meet the approval of every operator.

Further information may be obtained by addressing the inventor, Mr. J. C. Macurdy, P. O. box 426, Boonville, Mo.

CONDENSED MILK.

In answer to a number of correspondents who have asked how condensed milk is prepared we give the following:

When the milk is brought into the factory it is carefully strained, placed in cans or pails, which are put into a tank of water kept hot by steam coils. When hot it is transferred to larger steam heated open vessels and quickly brought to a boil. This preliminary heating and boiling has for its object the expulsion of the gases of the milk, which would cause it to foam in the vacuum pan and, also to add to the keeping quality of the milk by destroying the mould germs. A second straining follows, after which the milk is transferred to a vacuum pan, where, at a temperature below 160° Fah., it boils and is rapidly concentrated to any degree desired. The vacuum pan employed is a close vessel of copper, egg-shaped, about six feet high and four and one-half feet in diameter. It is heated by steam coils within, and by a steam jacket without—inclosing the lower portion. In one side of the dome is a small window through which gas illuminates the interior, while on the opposite side is an eye-glass through which the condition of the contents may be observed. The pan is also provided with a vacuum gauge and test sticks. Much of the milk used in cities is simply concentrated without any addition of sugar. The process of concentration is continued in the vacuum pan until one gallon of the milk has been reduced to a little less than a quart—one volume of condensed milk corresponding to about four and three-tenths volumes of milk. The following table of analyses by Dr. Waller shows the composition of several brands of this condensed milk sold in New York city:

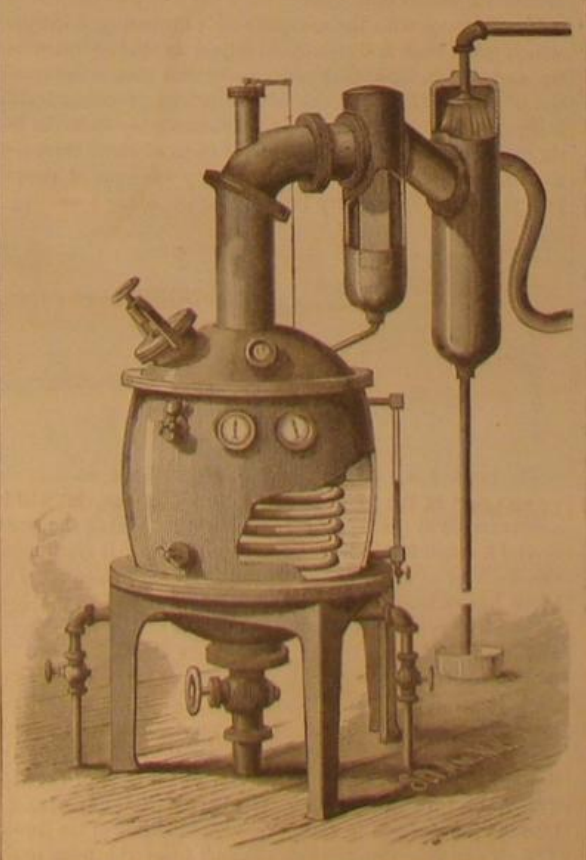
	American.	Eagle.	New York.	National.
Fat	16·29	14·35	14·28	13·97
Casein	17·26	15·07	13·96	14·02
Sugar	10·64	11·64	13·90	10·44
Salts	2·77	2·10	2·00	2·33
Water	53·04	56·83	55·86	59·24
	100·00	100·00	100·00	100·00

The average composition of fresh cow's milk is as follows:

Fat	3·799
Casein (and albumen)	4·369
Sugar	4·543
Salts	0·635
Water	86·660

Condensed milk intended to be preserved for any length of time has an addition of pure cane sugar made to it during the boiling, and is usually put up in sealed cans. This sugared or "preserved" milk, when properly prepared, will keep for many years. The following analysis of this "preserved" milk will serve to indicate its composition:

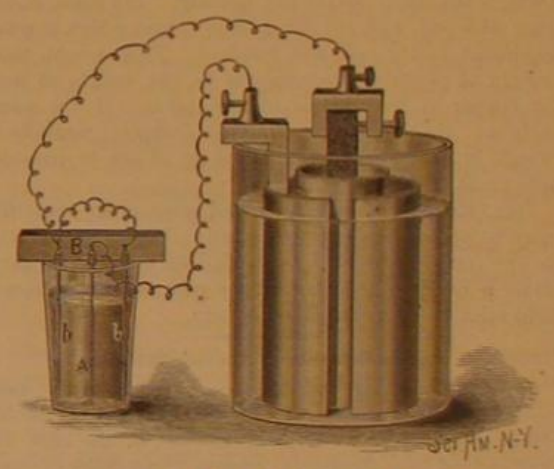
Fat	9·55
Casein (and albumen)	10·26
Milk sugar and cane sugar	53·34
Salts	1·91
Water	25·94



VACUUM PAN FOR CONDENSING MILK

ELECTRO-ASSAY OF COPPER ORES.

The average copper ore is difficult to assay by fire. The results, even where great care is exercised in the various manipulations, are rarely exact or trustworthy. The ordinary wet methods of analysis are rather complicated, slow, and expensive, good work requiring the facilities of a chemical laboratory.



ELECTRO-ASSAY OF COPPER ORES.

Correspondents who have asked how to test copper ores will find the following method simple, expeditious, and sufficiently accurate for all practical purposes.

The operations are, reduction of the ore to a uniform powder, sampling, decomposition and solution in acids, separation of the soluble and insoluble portions, decomposition of the dissolved copper salts, and separation of the copper by means of electricity.

A representative sample of the ore is reduced, by pounding and grinding it in an iron mortar, to a powder, the whole of which will pass through a wire gauze sieve of 100 to 120 meshes to the square inch. This powder is well mixed together, and a sample of one third ounce is taken for assay. The sample is put into a porcelain dish or cup, and enough hot water is stirred in (with a glass rod or clean slate pencil) to form a thin paste. About two ounces of strong nitric acid is then gradually added, and as soon as the first strong reaction has quieted somewhat the dish or cup is set in a pan and surrounded with hot water. The treatment with acid is best conducted out of doors, so that the abundant fumes may escape without injuring anything or poisoning the air. If too much acid is added at first the action is apt to be violent and some of the contents will be lost through spattering. The water in the pan, as it cools, should be replaced by hot water if it is not convenient to keep fire under the pan. When the disengagement of red fumes ceases, usually in the course of half an hour, the liquid portion (or as much of it as can be without disturbing the sediment) is decanted into another porcelain dish, which is placed in the water bath. More acid—an ounce or more, if required—is poured over the undissolved residue, and the dish containing it allowed to remain on the water bath another half hour. The partly evaporated acid solution, first decanted, is then carefully washed back into the dish containing the sediment with a little hot water, and the liquids allowed to evaporate to complete dryness over the hot water bath. Over the dry residue half an ounce of strong sulphuric acid is poured, cautiously, and the mixture is stirred until fumes are no longer given off. Then one ounce of cold water is stirred in, and after a few minutes' standing two ounces of

hot water are added, the mixture stirred, and the suspended matter allowed to settle.

The liquid is next filtered through a small piece of good filter paper adjusted in a glass funnel, the filtrate being collected in a small clean vessel of porcelain or glass. The residues are shaken up repeatedly with small quantities of clean water, the washings being thrown on the filter, and the filtered liquid allowed to mix with the clear acid copper filtrate. The dish containing the residues, as well as the filter, must also be rinsed with a little water, so that none of the copper liquid may be lost by adhering to them. If these operations have been properly conducted all the copper will be contained in the filtered liquid. The decomposing cell into which this liquid is next placed is shown in the illustration.

The cell is an ordinary flat-bottomed drinking glass. The strips, A, *b*, and *b*, are of thin platinum foil, three inches in length and two in width. Over the upper end of each piece a strip of lead foil is doubled, with the battery wires inserted and pinched between the lead and platinum.

The lead-bound edges are forced into slits in the strip of wood, B, which suffice to hold them firmly enough in position. The outer strips, *b* and *b*, are joined by wires and connected with the positive pole of the battery, the middle plate, A, being connected with the zinc pole. Two cells of any of the common gravity form of battery used on telegraph lines may be used, but a single element of the bichromate (carbon) type is preferable and more convenient.

In using the decomposing cell the plate, A (minus the lead binding), is first heated to redness for a few moments to cleanse it, then weighed and slipped into position, with as little handling as possible. The battery being set up and connected properly, the acid solution of copper is poured into the glass, the plates immersed in it, and the decomposition allowed to proceed undisturbed until the liquid has lost its color, and a drop of it, when brought into contact with a drop of strong ammonia water on a white porcelain surface, no longer develops a perceptible blue color. The plates are then lifted out, with care if the deposited copper does not adhere firmly, and the liquid in the glass is decanted and replaced by boiling water. This cleanses the plates, and the heat imparted by it causes them, when taken out, to dry quickly. The plate, A, is at once detached, with any filaments of copper which may have separated in the cell, and weighed. This weight, minus weight of platinum, corresponds to the weight of metallic copper in the sample of ore taken. If the sample weighed one-third of an ounce avoirdupois, multiply the weight in grains of copper found by 13·714, to convert it into terms of pounds per ton.

Iron, zinc, nickel, cadmium, and other minor impurities, may be present in the copper solution, but so long as there is any copper present no considerable quantity of any of these is likely to be thrown down with the copper from the acid solution with one cell of battery.

Large Schools of Sperm Whales.

Several incoming shipmasters have reported seeing schools of sperm whales working southward along the New Jersey coast, of late. Captain Sawyer, of the bark Ibis, just arrived from Pensacola, reports "two miles of blackbacks and water spouts" off the Carolina coast, July 16. He said to a *Sun* reporter: "It was on Saturday and Sunday when we encountered these sperm whales going south or southwest, as if to round Hatteras. They were going very slowly, backs above the water, and were spouting all of the time. They were strolling along in groups, sunning themselves half an hour at a time, and then taking a header, and coming up to spout.

"First we met two schools of about 100 each, I should say. Occasionally they frolicked and flopped about heavily in a sort of dignified and elephantine sport. More followed, and the next morning, Sunday, we saw more. Altogether there were over 700 on the picnic. We passed within 500 feet of two big fellows, but they seemed preoccupied and didn't notice the ship. I don't think they knew we were there."

"Had you any means of capturing them?"

"No; and it did seem a pity to have so much valuable sperm oil indolently swimming away from us. There were some big whales there too. I said to Limerick, one of my men here, 'Now, there's a fellow that's worth $2,000,' and he must have been, and there were bigger ones in the school. It would have been a harvest for a whaling ship. A million dollars in sperm whales is too good a haul to let go by, but we couldn't do anything. Occasionally I've seen a sperm whale cruising along as far south as Savannah, and once in a while I've heard of whale ships off about there. But I never saw so many whales at one time before anywhere."

It will be remembered that the Bermudas used to be the center of the sperm whale fisheries of the North Atlantic. Of late years the pursuit of whales has been almost abandoned, and they seem to have multiplied rapidly.

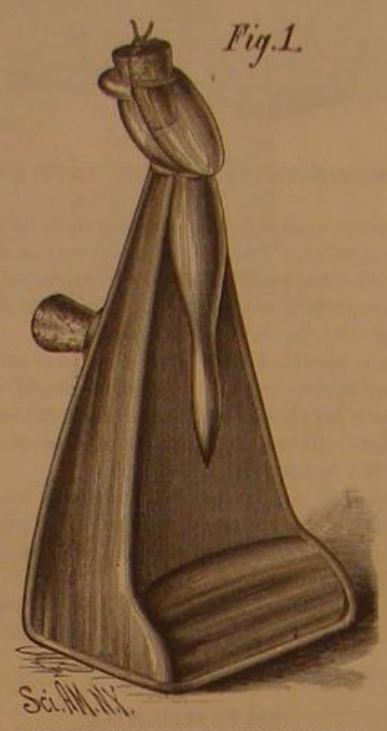
Birch Bark Rubber.

It is said that a dense black gum may be obtained from the outer layers of the birch tree bark by distillation, which possesses all the ordinary properties of gutta percha, and has the additional merit of resisting the deteriorating influence of air and the corrosive action of acids. This advantage makes it useful as an ingredient of India-rubber and gutta percha, which it renders far more durable. Whether these statements are true remains to be proved.

A NOVEL BOTTLE.

Dr. J. B. Moore, of Philadelphia, in *Druggists Circular*, has said that "it often happens, in dropping a medicine from a bottle a little too full or with a badly formed lip, the most steady and practiced hand can with difficulty drop a dose even with a near approach to accuracy." . . . "To the nervous and careworn attendants who are so frequently found in the sick chamber the task of dropping medicines becomes doubly irksome and annoying, and especially when it has to be done, as in cases of lingering illnesses, day and night, sometimes for weeks at a time. Besides, it is sometimes impossible, no matter with how much care and judgment the dropping is performed, to prevent the number of the prescription and the directions on the label from being defaced, if not entirely obliterated, as is often the case, and the outside of the bottle becoming stained and bedaubed with liquid, and especially if it be any of the stronger acids or iron preparation; and the trouble does not stop here, for the hands are liable to be stained, and the clothing, the furniture, or any damageable article that the medicine may come in contact with may be ruined or soiled."

Fig. 1.



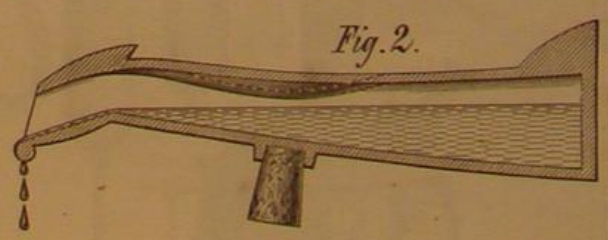
GOLDSMITH'S IMPROVED BOTTLE.

In the ordinary prescription bottle, during the act of dropping or pouring, the liquid is often two-thirds above the lower lip, and hence the air cannot find ready entrance, and either dropping or pouring becomes difficult and vexatious. In the improved bottle the liquid level (even when full) is always on a level with the lower part of the neck. Its inclined side and crooked neck form double inclined planes, which, with its shape and the airway, make it a complete dropper, obviating all the objections to the ordinary bottle. The liquid will not, during the act of pouring, "run back" outside to deface the label, the hands, or furniture. The shape secures steadiness; but should the bottle topple over a cork inserted in the recess on the inclined side will prevent breaking or spilling of the liquid, and the cork thus used will afford support and aid as a rest on dispensing medicines.

This bottle may also be used for table sauces, for perfumery, for patent medicines—for any purpose for which the ordinary bottle is employed

It does away with the necessity of purchasing a dropper, which takes time and trouble to adjust in the ordinary bottle, and which, besides the expense of first cost, is liable to be out of place or lost. In the new bottle the dropping feature is a part of the bottle and goes with each one, while the bottle can be made at a cost (not above that) of those imperfect and annoying ones, now in daily use by millions of people. It will become a necessity in every household.

Fig. 2.



The bottle has a conical or pyramidal shape, so that the greater part of the weight of the liquid in the vial will be concentrated at the base of the same, thus giving the bottle or vial a much better bearing and protecting it from being thrown over as easily as the bottles in use at present. This bottle has an inclined neck, with a lip or a bead at the lowest point of the edge to facilitate pouring the liquid from the vial in single drops. If the neck of the vial is inclined the flow of the liquid can be controlled much better than if the neck is straight. As is shown in Fig. 2, the liquid rests mainly on the inclined side of the bottle, and as it cannot flow up this inclined surface very small quantities of the liquid can be drawn by slightly lowering the neck of the vial. The vial is provided with an air channel for conveying air into the interior of the vial to prevent bubbling of the liquid. The air can pass through this channel from the neck to the extreme rear end of the vial. The cork is secured in the neck of the vial by means of a cord or wire, catching on a projection of the neck of the vial. For further information address the inventor, Mr. W. T. Goldsmith, 64 Corn street, Atlanta, Ga.

Correspondence.

A Remedy for Sea Sickness.

To the Editor of the Scientific American:

Having noticed from time to time the different remedies suggested for sea sickness, I concluded to give you my experience through two voyages of several days' duration, one during particularly rough weather. My first sensation on reaching the ocean was that of being in a very high swing. The same sensation of nausea immediately exhibited itself. It struck me at once that probably the same means adopted to overcome the sickness in the swing would prove effective on the sea, that was, to force the swinging. I therefore watched the motion of the steamer, and as she was about to descend I made an effort as though to force her down. Continuing this for a short time the feeling of nausea disappeared, and I had no recurrence of it during either voyage, separated by several months' duration. I have no idea that every one could be so successful, but I fully believe that nearly any one with a little determination and strength of stomach can easily overcome sea sickness by this means.

W. E. F.

Helena, Montana, August, 1881.

How to Prevent Car-Safe Robberies.

To the Editor of the Scientific American:

The late robbery of the safe of the express company on the Rock Island road leads me to offer the following plan to prevent such cases: The safe to be provided with combination locks; the safe to be locked by the express company's agent at New York city on leaving that place; the numbers of the combination to be telegraphed to agents of the express company at Chicago, San Francisco, and any intermediate places; the safe to be opened by them on its reaching their places. The messenger in charge of the car, not knowing the combination, could not, even by compulsion, open the safe, nor could it be opened by any practicable means except at the proper places.

WALTER L. SMITH.

Weston, Mass.

MISCELLANEOUS INVENTIONS.

An improved device for thawing out sink spouts has been patented by Mr. Amos Stevens, of Fairfield, Me. A pipe of considerable less diameter than the sink spout is passed through this spout and is as nearly in the middle of the spout as possible. The upper end of the inner pipe is slightly tapered outward, and passes through and is fastened to a slotted plate forming a strainer. This plate supports a cup fitting into the upper beveled end of the inner tube. If the water in the sink spout freezes, hot water is poured into the cup, from where it flows through the inner pipe and thaws out the sink spout in a short time.

Mr. George O. Denison, of Waterloo, Ind., has patented an improved bag holder made low in front and high in rear to expedite the filling of the sack and prevent the grain from running out at the rear of the bag holder. It is provided with suitable hooks adapted to be inserted into the upper end of the sack to secure it to the bag holder. The holder is partly supported by a coil spring.

An improvement in horseshoes, patented by Mr. Sebastian K. Minton, of Des Moines, Iowa, consists in the combination with halves hinged together at the toe and having their upper faces beveled inward of the toe calk, having a hole and slot, and heel calks having right and left screw threaded holes, by which the heel of the shoe may be expanded.

Mr. William T. McLean, of Sidney, Ohio, has patented an improvement in that class of earth scrapers the body of which is made of thin sheet steel with wooden backboard, the lower edge of which has always heretofore been secured to the scraper by means of rivets passing through the bottom of the scraper in such a manner that the rivet heads soon wear off by abrasion and let the backboard loose, which wholly disables the scraper for further use until repaired. The improvement consists in the construction and arrangement of the devices for more perfectly securing the wooden back to the steel body without the use of rivets.

An improved drag saw has been patented by Mr. Samuel Clemens, of Rockport, Ill. The invention consists in having the saw blade pivoted at one end of a lazy-tongs connected with the framework of the apparatus, and in having a hand lever pivoted to the said framework and connected with the lazy-tongs by means of a pitman to operate the lazy-tongs.

An improved sand guard for car axle boxes has been patented by Mr. Henry Koth, of New York city. The object of this invention is to improve the construction of the sand guards for which Letters Patent No. 235,298 were issued December 7, 1880, to the same inventor, in such a manner as to make them more effective.

An improved wagon step, patented by Mr. Henry F. W. Koehler, of St. Joseph, Mo., consists in a novel arrangement of a cam lever, a slotted crossbar, two connecting bars, and a step or steps, all arranged in a frame attached to the wagon body. By this means provision is made for lowering the steps for use or turning it up out of the way by moving the lever in one direction or the other.

Modern Bows and Arrows for Sport.

The increasing popularity of archery as a summer pastime has brought the bow and arrow once more into common use and made their manufacture an industry of considerable importance. In a long review of the development of archery clubs and the modes of shooting practiced in and about this city, the *Sun* furnishes the following information touching the construction and cost of materials used:

The best bow is one made of yew. Some yew bows that are very costly look crooked to the eye. The skillful archer, however, explains that they are quite straight. It is true that a bow may bend in and out in little irregular curves, but it is called straight all the same, because the artist who made it has allowed the grain of the yew to take its own course around knots, and has not weakened the bow by attempting to smooth it down. These strips of yew wood, from five to six feet long, and properly tipped with horn, may be worth $100 apiece, and they cannot be bought for less than $20 apiece. It is so difficult to get a piece of yew of equal quality throughout, that when a good piece of the wood, three feet long, can be obtained it is split, and two of the pieces are spliced. This gives a guarantee that each half of the bow will have equal degrees of elasticity at the corresponding parts.

You may either have a "self" bow or a "backed" bow. A self bow may be spliced in the middle, but it must be made all of the same kind of wood. A good backed bow is made in this way: A piece of dark snake wood, mottled and lined by nature like the back of a serpent, and very beautiful when polished, is trimmed into shape as if it were to be the sole material for the bow. It is elastic, but it is not strong. One side of it is trimmed into an oval or semi-circular shape, but the opposite side is trimmed flat. Upon this flat side is glued, in the most careful manner, a tough slat of hickory. This gives the bow strength, for when the bow is bent the snakewood must contract upon itself, and the hickory, being on the back, must stretch. Such a bow is worth from $9 to $12.

It is very important that the wood of a bow be properly seasoned. It should not be too dry. If the wood is too dry the first thing an archer knows he will find a chrysal in it. When he finds a chrysal in his bow, he must wind about the bow over the chrysal a fine string saturated with glue. A chrysal is a small crack in the bow, which is liable to enlarge and ultimately to cause fracture. It is a mistake to suppose a bow when at rest should bend a little backward. It rather should "follow the string" a little. Otherwise it jars the arms when the arrow is discharged, and should the string break the bow is apt to break. The wrapping of plush about the bow in the middle, where it is grasped when bent, is called the handle. The upper edge of this handle is placed about an inch above the middle of the bow. When the "weight," that is to say the power it takes to bend a bow, is to be tested, the handle is placed in the hook of a steelyard and the string loaded until it is drawn down twenty-eight inches for a gentleman's bow, and twenty-five inches for a lady's bow. Gentlemen's bows usually range from forty-five to sixty pounds, and ladies' bows from eighteen to thirty-five pounds.

Arrows in weight range from two shillings and three pence, lowest weight for ladies, to five shillings and six pence, highest weight for gentlemen. The method of weighing, or rather of recording the weight of arrows, has been handed down from early times. They were weighed against silver money, and great care was exercised then, as now, in making them of accurate weights to suit different persons and different bows.

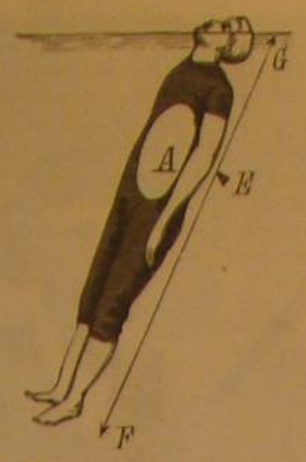
An arrow is made up of the "pile," or metal point, the "stele," or shaft, the feathers, and the "nock," or notch, of horn. It may be "barreled" (largest in the center), "bobtailed" (larger at the point than at the feather), "chested" (larger at the feather than at the point), or "straight" (of even thickness throughout). Arrows may be "self," that is, made of one piece of wood, or they may be "footed" with a piece of hard wood at the pile end. The finest arrows are said to be of red deal, footed with lancewood. When the arrow is laid in position it should be at right angles with the string, although some archers think they can cause the arrow to take a higher or lower flight according as they nock it lower or higher on the string.

At the recent third grand annual meeting of the National Archery Association in Prospect Park, July 12, 13, and 14, the distances for ladies varied from 50 to 60 yards, and for gentlemen from 50 yards to 100 yards. The number of arrows fired by one contestant in a match varied from twenty-four to seventy-two.

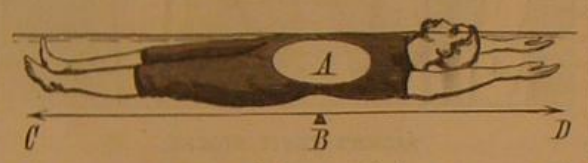
Froward, an English archer, is said to have shot an arrow from a 63-pound self-yew bow 340 yards.

THE SECRET OF EASY FLOATING.

The first lesson which the bather should learn is to float without effort on the surface of the water. The art of floating is set down as the first requisite, for several reasons. Even the most expert swimmer is liable to have his powers of endurance put to a test so severe that the art of resting on the water without effort may be of vital value to him; while to him who knows nothing of the art of swimming the ability to float securely is manifestly his only hope of



safety in case of accident on the waters. And the special merit of floating supine, as the first lesson in swimming, lies in the fact that it can be practiced in shallow water. Floating in a walking position, "treading water," is easy to learn, but it presupposes tolerably deep water; and the beginner is apt to have little confidence in the buoyancy of the unfamiliar element. Having learned to rest at ease on shallow water, the bather is able to float into deeper water without losing confidence, and can thus pass by rapid and easy stages to swimming on the back, or through the practice of treading water to the art of swimming in the customary way, face forward.



Any one who has sufficient resolution to assume the posture represented in the large engraving can float securely, even in tolerably rough water, absolutely without muscular movement, and with very little fatigue. A still more restful, though slightly less buoyant posture, is with the arms bent and the hands clasped under the back of the head.

The philosophy of the buoyancy of this posture is illustrated in the smaller cuts. The blank space, A, includes the lungs and other buoyant portions of the viscera. The quantity of air in this part of the body but little more than suffices to float the body. With the arms extended the body is, so to speak, balanced as upon a fulcrum at B; the natural tendency of the feet to sink is counteracted, and the body floats with the mouth and nose well out of water. With the arms at the sides, as in the other small cut, the preponderance of weight is below the center of buoyancy, the feet drop, and considerable effort is required to keep the nose and mouth from being submerged, either by throwing the head back, as shown in the cut, or by paddling with the hands. It is true that a very slight movement of the hands by a practiced floater suffices to keep the feet from dropping and the body horizontal; but that little effort, if long continued, is fatiguing, and is pretty sure to be unskillfully made by a novice.

Unless one is exceptionally lean or deficient in lung capacity, the art of floating with the hands under the head or extended above the head can be quickly learned; and in case of sudden emergency the non-swimmer will find it a certain and easy way of sustaining himself on water until help arrives.

PROPER POSITION FOR FLOATING.

Paste Diamonds.

The Providence *Journal*, which comes from the vicinity of immense cheap jewelry factories, has the following on "paste diamonds," which are simply glass of great purity:

"When imitation diamonds were introduced, it was found that to cut glass precisely like a diamond did not produce the sparkle characteristic of the diamond; therefore to secure this the flat surface on the top of the diamond was made pyramidal on the imitation, and, of course, ended in a point. By certain laws of light this pyramidal surmounting of the glass provided for the required distribution of ray surface to produce the diamond sparkle, or something akin to it. A real diamond is never cut with the pointed apex, and hence it was possible always to distinguish the real from the spurious. But after a time the buying public learned this little circumstance about the cutting process, and other means were resorted to. The glass was cut precisely like the diamond, and the sparkle was given to or provided for it by a coating of white foil applied to the lower side of the glass. The setting of many diamonds is arranged in such a way that the buyer may see the under side of the gem. This was overcome by arranging the setting so as to prevent inspection of this kind, which could not be done unless the stone was dismounted, if we may use that term.

"With these facts known to the buyer of diamonds, he need not be deceived except in the latter case, where the setting hides the under surface, and if he has any doubt about that he can let it alone. But the object of imitation diamonds is not to deceive buyers; if it was they would not be offered for two dollars. No one, however deficient in diamond criticism, need be deceived in buying diamonds. No dealer of any repute ever attempts to sell imitation for real diamonds. No reputable man ever thought of it. His reputation and occupation would soon be gone. There are very few persons who buy trinkets who do not test their wares at other than the buying place, particularly if the gem is a costly one, and it is certain that no one was ever presented with jewelry of presumable worth who did not set out at once to learn its purity and value, and very disappointing it has doubtless been to find in some cases that the gold or diamond was only brass or glass."

A Large Collection of Tobacco Pipes.

A collection of tobacco pipes, now on view in London, is pronounced by the *Times* one of the most interesting of minor art exhibitions. The collection includes specimens of all countries, and belonging to many periods, of the graven images and idols of clay which have been dedicated to the worship of tobacco. From France come pipes of Sèvres made in the national porcelain factory; from Germany old Dresden pipes and the pipe formerly smoked by the giant in the procession of the guilds at Cologne; from Holland several hundreds of the æsthetic clay called "Early Dutch," collected by Heer Van der Want, Master of the Pipemakers' Guild at Gouda. The Dutch contribution includes also specimens of the bridegrooms' pipes, clay ornamented with ribbons, which the farmer of the polders smokes on the day of his wedding and then lays by on the shelf, to be taken down once a year when the anniversary comes round of the momentous occasion. This pipe is regarded with great interest by smokers as an example of the various uses which tobacco serves in calming feelings of ecstatic joy and mitigating the pangs of regret. There are 700 early English pipes; Scandinavian pipes, with modern Runes inscribed upon them; Siberian bowls, the consolation of the exile, made of hard wood and mammoth ivory; Basque pipes, and the costly meerschaum and amber toys smoked by pachas in their seraglios. Ninety-six of the Japanese pipes are in ivory, twenty-four in wood, horn, rock crystal, agate, etc. The carvings illustrate the social life of Japan in its most amusing relations. One pipe which formerly belonged to Enomoto, foster brother of the Emperor, bears the imperial symbols, and the central portion is entirely inlaid with gold. The bowls are extremely small. A pipe contains merely a whiff. A piece of tobacco is rolled up to the size of a pea, and one long, soothing exhalation exhausts it. The smoke is retained for some time in the lungs, as usual in the East. It is no matter of surprise that, according to the narrative of the Earl of Elgin's mission, a Japanese will smoke fifty such pipes in a morning.

From China come the opium pipes, which balance the finances of India—tubes of jade or tortoise shell, bowls of silver and enamel. Hookahs from India, the calumets of peace and war from North America, the pipes of the Aztecs and the Caribs, the latter called "tabaco," whence the European name of the weed originally consumed in them is said to be derived; pipes smoked at the great "customs" in Central Africa, the sperm whale's teeth carved into bowls, pipes from Caledonia and New Guinea, are also to be seen.

NEW INVENTIONS.

An improvement in curtain fixtures, patented by Mr. Geo. A. Crisson, of New York city, consists in an improved swinging curtain bracket formed of a plate provided with segmental transverse slot, into which a beveled stud of a slide loosely mounted on the guide rod of the window casing and suspended from suitable cords passes, this plate being pivoted at its upper end to this slide.

Mr. Louis K. Derby, of Philadelphia, Pa., has patented an improved beam compass. The invention consists of a T-shaped beam made in sections that are jointed and clamped together, and graduated in fractions of an inch, and having a vernier, which is attached to the sliding leg.

Messrs. Samuel J. Wright and Loftus L. Wright, of Mineral Point, Wis., have patented an improved flood-gate, constructed in such a manner that it will be opened automatically should the water rise above a fixed height, and that the gates, when opened, will offer no obstruction to the passage of float wood or other rubbish.

A convenient device for holding mail pouches or sacks in an open position has been patented by Mr. William J. Taylor, of New Albany, Ind.

Mr. Ottmar Spachmann, of New York city, has patented an improved barrel support, which is so constructed that the barrel can be pulled forward and inclined, so that all the liquid in it can be drawn conveniently, and at the same time this construction permits of placing the barrel upon the support or taking it from the same without any great exertion.

Mr. William F. Trippensee, of Clarence, N. Y., has patented an improved feeding attachment for fanning mills, which consists of a curved feed lever, a connecting rod hinged to the shoe operating connecting rod, a double-jointed coupling for connecting the rod and lever, a stud to fulcrum the lever, and a feed arm or point attached to the curved lever, whereby the feed lever will be vibrated to feed the grain by the up-and-down movement of the shoe operating connecting rod.

Another Improvement in Trotting Time.

The fastest trotter in the world, Maud S., beat her previously "best time" by quarter of a second, at Pittsburg, Pa., July 13. She trotted the mile in 2:10½.

Following is the official record of the time by quarters:

First quarter	:33	Three quarters	1:37¼
Half mile	1:05½	Full mile	2:10½

Maud S(tone) is seven years old. Her first famous record was made in Chicago last year, beating St. Julien's 2:13 by a second. Afterwards St. Julien made 2:11¼ at Hartford, and at the fall meeting at Chicago Maud S. beat that record by trotting a mile in 2:10¾. The third quarter-mile at Pittsburg was made in 31¾ seconds, or at a rate which, if maintained, would cover a mile in 2:07.

NEW DOUBLE PLUNGER STEAM PUMP.

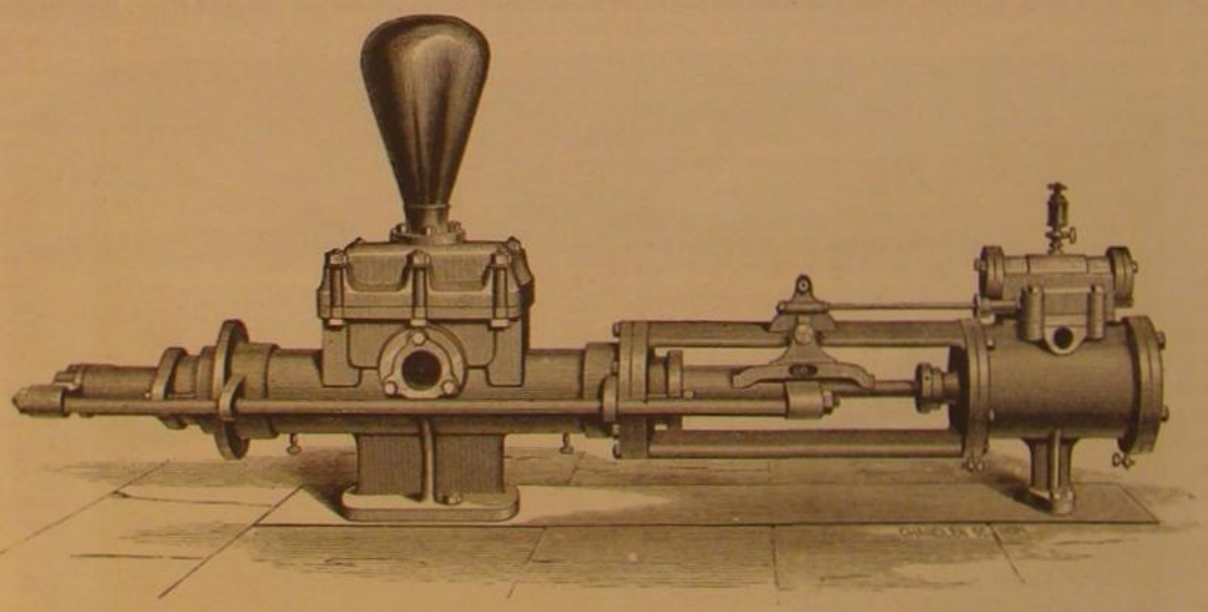
We give an engraving of a new double plunger steam pump for forcing water containing sand, mud, lime, or any impurities which are liable to cut the cylinder of piston pumps. For feeding boilers with hot water this type of pump is preferred by steamboat men, rolling mill and furnace engineers. In ordinary piston pumps the sand or dirt rubbing between the piston and cylinder will wear them. In the pump illustrated the space between the plunger and cylinder allows the free passage of destructive material.

The only wearing point is in the stuffing box, and this can be easily repacked. The plungers are connected by two rods which pass outside the cylinders. It will be seen that it is impossible for any water to pass the plungers from one end of the pump to the other.

The steam valve gear is a new and simple device. The plunger next to steam cylinder has a projecting roller, which passes between the flanges of the cam lever. When the plunger nears the limit of its stroke, the roller passes between the curved flanges near the end of the cam lever, causing it to tilt and shift the auxiliary steam valve, reversing the motion of the main piston and plungers. As the pump starts on the return stroke the cam lever is thrown back into its first position, which brings the auxiliary on its center and closes the ports communicating with the chest piston. By this arrangement there is no chance for steam to blow through on account of the chest piston becoming worn and leaky.

These pumps are also made for pumping out mines, and they are at present working in mines, pumping from a depth of 400 feet. With plungers and stuffing boxes made of gun metal they will resist the action of bad mine water. The water passages are nearly equal to the area of plunger. The valves can be easily taken out.

These pumps are manufactured by Dean Brothers' Steam Pump Works, Indianapolis, Ind.



DEAN BROTHERS' DOUBLE PLUNGER STEAM PUMP.

NOVEL FRUIT PICKER.

The engraving shows a novel fruit picker, patented by Mr. John Sager, and being introduced by Messrs. John Sager & Co., of Thamesville, Ontario, Canada. The invention consists of a long canvas tube attached to a ring at the end of a long handle, A, and two semi circular jaws, D, mounted over the mouth of the canvas tube, and operated by a rod, B, extending down the handle and provided with a thumb piece.

SAGER'S FRUIT PICKER.

The details of construction can be seen in Fig. 2. The manner of using the implement is shown in Fig. 1. The open end of the canvas tube is placed around the fruit, the semicircular jaws are closed upon the stem by pulling down the thumb-piece, and the fruit is conducted by the canvas tube to the ground or to some suitable receptacle without bruising or injury.

Prof. Winchell on Evolution.

In a recent lecture before the Summer School of Christian Philosophy, at Greenwood Lake, Prof. Alexander Winchell, of the University of Michigan, discussed the speculative consequences of evolution. Speaking of the predicament of those who stake all religious truth on an allegation of the untruth of evolution, in case the method of nature is finally found to be a method of evolution, he said: "At this moment the well-nigh unanimous verdict of the scientific world sustains the doctrine of evolution. This verdict is one of the criteria of truth. Repudiation of it is a hazard which only rashness and ignorance will incur. To stake all religious belief on such repudiation is to throw all of man's spiritual interests upon the hazard of a die. As I understand it, the recognition of a method of evolution in nature's operations does not involve consequences deleterious to a spiritual faith, but is a means, on the contrary, for approaching into closer relations with the immaterial forces of the Divine government of the world. We must first establish a clear conception of evolution. Multitudes of men imagine evolution and Darwinism to be synonymous terms, if they do not even believe them synonymous with materialism, as is so often charged. I conceive the evolution which I discover in nature to be the progressive differentiation of an identical existence. It proceeds from the more general to the more special, from the homogeneous to the heterogeneous. It means that new forms of existence are only older existences transformed and not new beginnings of existence. Every department of the cosmos has had a history, and every present is the outcome of a past. It takes no cognizance of special originations, but only of the history which follows. Evolution, I say, knows nothing of creation. This is not because it contravenes creation, but simply because creation is an event which does not come within its purview. Evolution is the name of a mode of continuance, not of a mode of beginning. It can neither affirm nor deny any mode of origin."

Food for Infants.

The French Commissioners on the Hygiene of Infancy, in awarding the prize in a competition of essayists, report that the conclusions generally arrived at lead to the following recommendations: No child should be reared on artificial food when the mother can suckle it, but such food is preferable to placing the child with a wet nurse, poorly remunerated, and living at her own home. For successfully bringing up an infant by hand, the best milk is that of a cow that has recently calved, or similarly of a goat, to which should be added during the first week a half part of water, and subsequently a fourth or less, according to the digestive powers of the child. Glass or earthenware alone should be used; no vulcanized India-rubber mouthpieces or vessels containing lead ought to be employed.

Growth of Telegraph Monopoly.

The rise and progress of the Western Union Telegraph Company is thus set forth in a prospectus issued by a rival company:

Beginning as the House Printing Telegraph Company, with a capital of $360,000. On the first of January, 1863, by stock bonuses, and the purchases of other lines, its capital was increased to $3,000,000. On the 2d of March, 1863, this was watered by exactly doubling its capital and presenting the additional shares to stockholders, thus raising it to $6,000,000. May 28, 1864, it was further increased, by purchase and extension of lines, $5,000,000, making its capital $11,000,000, and at the same time the whole of its stock was again doubled by an issue of 100 per cent bonus to its stockholders, making its capital $22,000,000. From this period up to January, 1868, it took in the United States Telegraph Company at $3,333,333, and absorbed the American Telegraph Company, with a capital of only $2,000,000, taking it in at $11,818,800, and by bonuses and extensions of lines, etc., its capital was increased to $41,068,800; and recently it absorbed the Atlantic and Pacific Telegraph Company, whose lines cost not more than $2,500,000, and the American Union Telegraph Company, with its lines, which cost little more than $2,000,000, taking them in at $25,000,000, and at the same time issuing a stock bonus of $15,000,000, thus bringing its capital up to $80,000,000. In addition to all this it sank $3,000,000 in the abandonment of the Russian Telegraph, and nearly as much more by the abandonment of the California lines and contracts for lines parallel to the Pacific Railroad, and it also borrowed $5,000,000 for the purchase of real estate in New York, and pays $75,000 per annum rental for the California State Telegraph Company; $85,000 per annum rental for the Illinois State Telegraph Company; purchased a majority of the Pacific and Atlantic, Southern Atlantic, and Franklin Telegraph companies, and guarantee perpetual dividends on the minority of the stock; and recently leased the Northwestern Telegraph Company, and pay a large rental on a stock and bonded capital of nearly $4,000,000, besides rentals of other leased lines, making its capital really about $100,000,000. The increase in the volume of its business and the amount of its earnings have kept pace with its increase of capital, until now its traffic is over 30,000,000 of messages, gross receipts over $15,000,000, and net earnings over $6,000,000 per annum; and all this with no improvement in method and but little improvement in appliances over the first line constructed forty years ago; moreover, this gigantic monopoly, touching and influencing every branch of commerce and industry, is controlled by one man, whose sole object is self-aggrandizement.

DISTINGUISHING SPURIOUS HONEY.—A solution of 20 parts of honey in 60 parts of water mixed with alcohol gives a heavy white precipitate of dextrine if glucose has been added, while genuine honey, if treated in the same manner, merely becomes milky.

ENGINEERING INVENTIONS.

Mr. Charles E. Macarthy, of Forsyth, Ga., has patented an improvement in horse powers of that type in which a king-wheel is arranged in horizontal position on a vertical post rotated by lever arms below, which wheel has a rope belt that passes around and drives a speed pulley, from which the power is utilized, while a tension pulley and idler pulley serve to give proper direction and tension to the rope.

An improved form of feathering paddlewheels for steam vessels, whereby the full power of the paddle against the water is utilized for the effective part of its movement, while the carrying of dead water is avoided by the paddles as they pass from their lowest position to the surface in the rear, has been patented by Mr. Joseph F. Breux, of Hardwick, Vt.

Mr. Charles E. Macarthy, of Forsyth, Ga., has patented an improvement in automatic car couplings, and it has reference to that class of such couplings in which a sliding block is arranged in the throat of the draw bar, and is pressed forward by a spring past the hole for the coupling pin, and which is made to hold up the coupling pin until the said block is forced back from under the coupling pin by the entering link of the opposite car, when the coupling drops through the link and couples the cars.

An improvement in slide valves has been patented by Mr. William S. Hughes, of Long Island City, N. Y. The main object of this invention is to reduce or prevent the noise made by exhaust steam of engines, which has heretofore been attempted by the use of muffles and similar devices. With the ordinary link motion and slide valve used on locomotives the exhaust edge of the valve must be moved the length of lap and lead before the piston receives steam from the direction in which it has been moving. In other words, the exhaust opening begins before the piston finishes its stroke, and before the steam has fully expanded. The exhaust being also opened suddenly by the quick movement of the eccentric, a wasteful and disagreeable explosion of steam from the cylinder takes place. To remove this difficulty the exhaust steam, instead of being allowed to explode, is gradually released, and without back pressure.

Mr. Abraham O. Frick, of Waynesborough, Pa., has patented an improvement in valve gears for changing the relation of the eccentric to the main crank. It is an improvement in that class of valve gear in which one or more cog wheels are arranged between a rigid gear wheel on the shaft and a loose gear wheel carrying the eccentric.

An improved elevator has been patented by Mr. Henry D. O. Kurrus, of Boston, Mass. The object of this invention is so to construct a passenger elevator that the cage cannot by any accident fall nor be elevated above a fixed point, and will automatically adjust itself to any inclination of the building occasioned by settling, warping, or shrinking.

Liberian Coffee.

The expectations awakened by the discovery of the species of coffee indigenous to Liberia, and its exemption from the blight which has ruined so many plantations of Arabian coffee, seem to have been well founded. Already it has furnished relief to the planters of Ceylon, and there is every promise that it will enable San Domingo to recover the standing it enjoyed fifty years ago as a coffee-growing island. Its productiveness is great, the tree is large and hardy, and the quality of the berry (certainly as represented by that sent to this market from Ceylon) is equal to the best.

In a recent pamphlet on the cultivation of Liberian coffee in the West Indies, Dr. H. A. A. Nichols says that its immunity from blight is of the utmost importance to the welfare of Dominica and the neighboring colonies, both English and French, for there is now nothing to prevent the islands of the Lesser Antilles from being once more large coffee-supplying countries. In Dominica the cultivation of coffee may be said to be re-established, although it is only yet in its infancy, and the productiveness of the Liberian trees is a matter of astonishment to those of the older residents who remember the coffee estates of forty years ago. The Liberian coffee plant is much larger than that of Arabia, being indeed in its native state a small tree. It has several other characteristics which render its cultivation different from that of its Arabian congener, and give it several advantages, all in favor of the planter. Its leaves are much larger; it flowers for several months, so that flowers and berries may be found on the same plant, and the berries are twice the size of the ordinary coffee bean. The ripe berries do not fall from the tree, like the ordinary coffee plant, but remain on the tree, without detriment to their quality, for weeks, an important feature, where it may be difficult to procure the labor necessary for speedy gathering.

SEVRES VASE.

The Imperial Manufactory at Sèvres has unquestionably taken the lead in pottery art work, not only in the designs in general, but in the unique and artistic ornamentation.

SEVRES VASE.

The engraving presents an example of this work which differs from other vases illustrated in these pages, both in respect to its configuration and its decoration.

THE SEVRES PORCELAIN FACTORY.

We give an engraving of the celebrated porcelain factory at Sèvres. We have frequently given illustrations of the beautiful wares from these works, and have outlined the history of the porcelain industry, giving some of the leading facts. This porcelain factory was removed from Vincennes, in 1756, to its present picturesque site in Sèvres, on the left bank of the Seine, six miles from Paris. It stands between the hills of Meudon and St. Cloud.

THE PORCELAIN FACTORY AT SEVRES.

The great reputation of the Sèvres factory is due to the employment of the highest artistic skill, both in form and decoration. A very large number of artists are employed, and the work has no equal.

The Selenium Cell.

At a recent meeting of the Physical Society, Dr. James Moser, read a paper expressing his opinion that the well known action of the selenium cell in Professor Graham Bell's photophone is not so much a mechanical, physical, or chemical one as it is a microphonic action. The cell is usually composed of metal plates cemented together by annealed selenium, and having wire electrodes. Dr. Moser, therefore, argues that the junction between the metal and the selenium is what electricians term "a bad joint," or in other words a microphonic contact. The varying beam of light from the photophone transmitter, falling upon the cell, expands and contracts the metal plates or the electrodes by virtue of the heat rays, and thereby tightens and slackens the microphonic joint. This has the effect of undulating the current of electricity which flows through the cell, and causing the modulations of the voice to be audible in the telephone. Dr. Moser showed that with copper plates the selenium cell was really a pile of copper, selenite of copper, and selenium, built up in order, and he compared it to the thermoscope of Professor Hughes and Mr. Edison, in which a number of little cakes of carbon are arranged end to end in a glass tube with brass filings between. When a current is sent through this combination it becomes very sensitive to heat rays falling on it, owing to the expansion of the carbons by heating and the consequent closing of the microphonic joints between them.

An Ancient Mat.

At a late meeting of the San Francisco Academy of Sciences, Mr. B. B. Redding presented, from Captain Mellon, an interesting fragment of a prehistoric mat or garment with a piece of wood attached, found in a deposit of salt, seven feet below the cap rock of the Belding ledge, on Virgin River, six miles above its junction with the Colorado, in Lincoln County, Nevada. Mr. Redding said it was probably very old indeed, and was knit by hand from the inner fiber of some tree. He believed only one similar case had been found in Louisiana, where, like this one, it was directly over a bed of salt; and that was among bones of the mastodon and fossil elephant, thus clearly establishing its great antiquity.

He has written to learn if the cap rock was formed by accretion, or if a land slide could possibly have occurred in the vicinity. If it came where found by the ordinary sedimentary process, and not by any cataclysm, it is a most valuable proof of the vast period of time during which man has existed on this continent. It may be thousands of years since this work was woven, and it has only been preserved to come down to our day by the immediate presence of extensive salt beds. This will add to the rapidly accumulating evidence of the great antiquity of man on the American continent. It will be interesting also to know whether the mat is a specimen of weaving, matting, or knitting.

Quebracho Wood.

Mons. F. Rhem has lately communicated a paper on the "Quebracho Wood" to the *Société Industrielle de Rouen*, from which the following particulars are extracted:

This wood belongs to the family of the Asclépiades, and comes from America. Being very hard, and composed of a great quantity of interlaced fibers, the tannin it contains is different from that of chestnut or of oak. Gelatine precipitates this tannin out of a water solution with a flesh color, while salts of protoxide of iron give an ash-gray precipitate, and the peroxide salts a dirty greenish coloration. When boiled with weak sulphuric acid, the tannin is not converted into gallic acid. According to a German chemist, quebracho wood contains 18 per cent of tannic acid. The bark of this wood contains an alkaloid analogous to quinine. Extract of quebracho, now much used in wool dyeing, giving a yellow shade with a tin solution. It gives even shades, resembling those of cutch, if used with bichromate of potash, but its principal use is for obtaining blacks, for which the wool is given first a bottom of the extract, then passed through iron, and dyed with the quebracho; this, in these conditions, can replace cutch. Solutions of quebracho wood, or extract, will only keep limpid if heated to a certain temperature, but get turbid on cooling. Dyeing experiments, with the dry quebracho extract, as manufactured by a French firm, in comparison with cutch, have proved the former of more value, since, with a lower price, it possesses a greater richness of coloring matter. Three series of trials were made, one by passing the cotton prepared in a quebracho or cachou bath through bichromate of potash, the second through iron, and in the third the patterns were passed through iron and then chromed. In all cases the same results were obtained, showing the advantage of the quebracho over cutch, in spite of a slightly more grayish shade of the colors obtained with the former. The same

results have been got by printing mordants on calico, aging, dunging, and dyeing with quebracho extract or cutch; in all cases the quebracho shades being identical with those of cutch, not only for the tone of color, but also in regard to fastness.

STEAM BOILER NOTES.

We learn from Chief Engineer McDougal's annual report for 1881 that the French decree relating to inspection of stationary steam boilers requires that all new boilers pass a test which consists of subjecting them to hydraulic pressure superior to the working pressure allowed, to be maintained during the examination of every part of the boiler. As a general rule the pressure to be double the working pressure, but never to be less than 7 pounds nor more than 85 pounds above such pressure. There must be two safety valves, so loaded that the steam will escape at maximum limit, which is stamped upon the boiler in a conspicuous place, together with the date of the last test.

The area of each safety valve (two on each boiler) must be sufficient to prevent the pressure exceeding the limit, whatever may be the intensity of the fire.

Every boiler must have a pressure gauge *in good order*, marked plainly to show the point that must not be exceeded by the pressure; a check valve, a steam stop valve on the boiler itself, and two water gauges independent of each other, one of which must be a glass gauge, so constructed that the tube may be readily cleaned, and its casing conspicuously marked for the low water level.

All boiler plates (not in separate superheaters, or small, and so located that they cannot become red hot) exposed to the flame on one side must be in contact with water on the other side.

The registry of all "fixed" boilers must be made before they can be put to work. It must show the origin of the boiler, the place where it is fixed, its shape and heating surface, its official and special number, and the purpose for which it is used.

A table is annexed to the decree that shows the temperature of the water in any given boiler when working at limited pressufe, and all boilers are classified by multiplying their capacity in cubic meters by the temperature in excess of the atmospheric boiling point in degrees centigrade. Boilers giving a product greater than 200 are denominated first class; those from 50 to 200, second; and those at or below 50, third class.

Boilers of the first class must be fixed in one story buildings, and if not protected by heavy walls, 50 meters must intervene between them and any dwelling house, but in no case are they to be nearer than 3 meters, except when located with their top line 1 meter or more below the ground line.

Boilers of the second class may be fixed in workshops of any kind if no part of them are dwellings.

Boilers of the third class may be placed in shops or dwellings, provided the furnace is half a meter clear space from neighboring houses.

Portable boilers, or such as do not require special fixing or setting in brick, must, in addition to the above, be provided with an engraved plate, on which plainly appears the owner's boiler number and his business address. The attendant must be able to show a copy of the registry declaration whenever required to do so.

All the regulations, except those specially applicable to stationary, apply also to locomotive boilers, but some special rules relating to the rights of locomotion are provided.

Detached vessels that may be heated by steam to above the atmospheric pressure of a capacity greater than 22 gallons (English) must also be registered and stamped, and the test pressure must be 50 per cent in excess of the working pressure, but never more than 57 pounds per square inch. They must be provided with safety valves that will, when lifted, prevent the pressure from rising above that indicated on the stamp.

Tanks in which water is confined at high temperatures, serving as storage reservoirs of power or heat, are subject to the same rules as receivers of steam.

Users of steam apparatus must see that they are kept in good working order, and report to the official engineer any important repairs that are made after inspection.

In case of accident, by which injury to any person is caused, the owner or his representative must at once report to the local police and the government inspecting officer, who will proceed as soon as possible to the scene of accident, and report to the *Procureur* of the Republic and the Chief Engineer, who will inform the proper magistrate.

The building must not be repaired nor the fragments of the exploded boiler removed or altered before the engineer makes his official inspection.

In 1878 there were 79,071 land boilers and steam vessels under surveillance in France, of which 32 exploded during that year, or nearly 1 in 2,200, while there were among marine boilers in the same year 1 explosion in every 614 boilers.

J. McM. asks: "Is there any difference between the bursting and explosion of steam boilers?" It may be said in response that by common acceptation among engineers bursting means rupture, while explosion implies rupture, but it is also accompanied by detonation. The terms as applied to bombshells are used indiscriminately by many writers. As applied to steam boilers "bursting" may be considered a rupture from internal pressure, and "explosion" the loud noise and flying to pieces of the boiler after the rupture. This last will always occur with ordinary working pressures if the initial rupture is of sufficient size and suddenness to instantly relieve the contained water of pressure. Every elementary atom of the water then gives up its quota of steam, which causes an expansion of the mass of such suddenness that it may be characterized as explosive.

Another correspondent asks: "Does it take more fuel to run an engine with steam at a given pressure than to keep the same pressure without running the engine?" A. Yes. To maintain a given pressure already existing in a steam boiler no fuel at all would be required when no steam is withdrawn from or condensed within the boiler. Banked fires will usually keep up the pressure even in unprotected boilers when the engine is stopped.

Steel boilers appear to be making slow progress in France, as shown by a paper recently read by M. Jourdain before the Societe des Ingenieurs Civils. In response to an inquiry by the president of that body, M. Jourdain, whose paper discussed the subject of boiler inspection associations, stated, according to *Engineering*, that a certain number of makers were employing steel plates for parts directly exposed to the fire, but that he did not know of any stationary boiler constructed entirely of steel. As M. Jourdain is in a position to be well acquainted with French practice, we conclude that our neighbors are greatly behind us in the use of steel for steam boilers.

A large steam pipe connecting the boilers with the engine at Foster & Merriam's shop in Meriden, Conn., is reported to have recently burst with a noise like the explosion of a cannon. John Leary, who was in the vicinity, was badly scalded, and a boy named Doran was knocked senseless. The engineer is reported as saying that the pipe was too tightly bound in the brickwork, hence the explosion. If he had told us that water had collected in the cast iron pipe and had cooled during the night, so that unequal expansion occurred on opening his valve in the morning, he would have made a reasonable statement. Many a cast iron pipe has done so before.

Striking Oil in a Titusville Garden.

A dispatch to the New York *Sun*, dated Titusville, Pa., July 16, says that a month or so ago, Sebastian Haehn, a blacksmith, living in Mechanic street, this city, was spading in his garden after a heavy rain. As he turned up the earth, he noticed that little pools of crude petroleum formed in the cavities made by the spade. He dug a pit four feet deep. It filled up with oil to such an extent that he dipped out five barrelfuls. The oil was of excellent quality, and Haehn sold his five barrels to the Octave Oil Refinery. Week before last, Haehn dug another "well" in his garden. It responded with a yield of two barrels an hour. The well attracted great attention. It produced eighty barrels, and then ceased to flow. The excitement over the novel oil territory died out soon afterward.

On Monday last, the news spread through the city that Haehn had opened another well in his garden, and that it was yielding at the rate of thirty-six barrels a day. Hundreds flocked to the scene of the new oil operations. The well was located in the southwestern corner of Haehn's potato patch. With a large tin hand pump, the owner was taking out of the "hole" two barrels of oil an hour. His previous well had also started again. From that, one of Haehn's sons was taking oil at the rate of twenty barrels a day.

Immediately following this strike of the lucky blacksmith, a great demand for leases of adjoining gardens arose. Such an oil field had never been heard of before. Without capital, and with no tool but a shovel, an operator could sink a well and strike the "sand" in half an hour. The right to dig on four feet of a man's garden became worth $5 bonus and one-quarter of the oil. For three days Mechanic and adjacent streets have been thronged with excited spectators of the new operation in oil production, and parties anxious to get a "piece of the territory."

On Tuesday night, Theodore Avery, who had a coal yard adjoining Haehn's garden, put down a well. At the depth of four feet he struck oil. The yield was a barrel an hour. He has put down four more wells since. The five wells were yesterday yielding eight barrels an hour.

The success of the Haehn and Avery ventures led to a wide extension of this strange territory. A vacant lot on Washington street, southeast from Haehn's, was yesterday the scene of active operations. Three producing wells were put down. The rest were "dusters." Captain Pickering went to "wild-catting" under a shed near the Buffalo, Pittsburg, and Warren Railroad track, south of Haehn's. He dug to a depth of eight feet, and got a well good for ten barrels a day. Two wells were put down on the ground of the Octave Refinery. At five feet oil was found. One of the wells is pumping twenty-five barrels a day. The McKeown Garden, east of the refinery, was leased by J. P. Thomas, William McKenzie, and J. M. Brinton. Thomas took the northern half of the garden. He got two five-barrel wells of excellent green oil. The other parties struck oil, but it was of a red hue, and had the appearance of being mixed with tar. In the gardens along the east side of Washington street, several wells "came in" as good producers, but the oil was of an inferior quality. All the property along Oil Creek, between Washington and Franklin streets, has been leased by A. J. Kraffert. He will develop it on a large scale. The original Haehn territory maintains its yield, and is being further developed. Haehn has made a trench all around his garden and one through the center. In these the oil collects rapidly. The operator is putting up tanks to receive his oil, as there is a great scarcity in barrels. Haehn's garden is now yielding one hundred barrels a day. He expects to increase it to two hundred. The oil is worth, at the refineries, $1.10 a barrel. The price of one barrel defrays all the expense of putting down a well. Operations are carried on day and night. That part of the city is lighted up all night by the flaming torches of the oil men. The weird scene is witnessed nightly by hundreds of people.

There are no indications of any decline in the yield of this oil, and Haehn, the lucky discoverer of the field, is laying away not less than $100 a day as clear profit.

There are many theories in regard to this unheard-of presence of petroleum in large quantities so near the surface. One is that the oil is the leakage of tanks and pipe lines, which has sunk into the earth until it reached the gravelly deposit, in which it is now found in pools. Another is that this deposit has been forced up from the true petroleum sand stratum by some unknown agency, and caught and retained in the stratum where it now lies.

MECHANICAL INVENTIONS.

An improved cotton press has been patented by Mr. Charles E. Macarthy, of Forsyth, Ga. This invention relates to certain improvements in presses for baling cotton or other analogous material, of that type in which the box is made to revolve, and the follower is forced down in the same by the action of a screw stem. The improvement consists in the peculiar means for throwing the screw stem and follower to one side of the mouth of the box, to permit the packer to have free access to the same to pack the cotton therein.

Mr. John Flanagan, of Newburg, N. Y., has patented an improved pipe wrench with an angular stationary jaw, a slotted shank, and an inclined handle made in one piece, a movable jaw having a concaved outer end, and a fastening nut, and a swiveled screw for adjusting the movable jaw, whereby the wrench can be adjusted to grasp pipes of different sizes.

An improved grounding machine for paper hangings and other materials has been patented by Mr. Thomas B. Smith, of West New Brighton, N. Y. The object of this invention is to apply the ground color to paper hangings and other materials rapidly and uniformly. The invention consists in giving to the rotary brushes that distribute the color a longitudinal movement by eccentrics and levers, to insure a uniform application of the color to the paper, and also in attaching the fulcrum studs of the levers to the bearings of the brushes, so that the brushes can be adjusted without disarranging the connection between the levers and brushes.

An improved hub for wheels, which will not shrink and warp, and which is durable, has been patented by Messrs. Alonzo Gandy and Rusinus M. Black, of Freeport, Ohio. The invention consists in a hub constructed with a central ring of wood into which the inner ends of the spokes are mortised, and which is provided with a conical continuation or sleeve toward the outside of the wheel, upon which central ring of wood a flanged ring is placed at each side. These flanged rings are bolted or riveted together, so that the inner ends of the spokes will be held between the flanges. The axle box passes through the central ring and the conical sleeve, and is held in this hub by lugs fitting in grooves in the flanged rings.

The New Comet.

The comet discovered by Professor Schaeberle, of Ann Arbor, July 13 (Comet C, 1881), is now visible through an opera glass, and will soon be to the naked eye. Its identity is still uncertain; most probably there is no record of its previous appearance. It is expected to be one of the most conspicuous comets of the century. Under date of July 22, Mr. Henry M. Parkhurst says: "It may not equal Gould's comet in brightness, for the nucleus may not be brighter than the north star, and yet it is not uncommon for the brightness of a comet after passing its perihelion to much exceed that computed from its appearance before its perihelion passage. It has already developed a tail as marked as that of Donati's comet an equal time before its perihelion passage, and it would now be visible to the naked eye but for the presence of the moon, although perhaps not distinguishable from a star. Up to the 15th of August the comet will be visible in the morning in a direct line between Aldebaran and Theta Ursa Major, being now midway between them. On August 15 it will be near Theta, with its tail pointing toward the north star. It will then cease to be visible in the morning, not rising until after twilight begins. It now sets at the same time with the sun, but will gradually set later, so that it will become visible in the evening before it is entirely lost in the morning. On August 19 it will be near Nu Ursa Major, with its tail pointing toward and perhaps reaching Gould's comet, then visible only in the telescope in the Little Dipper. On August 25 it will be in the constellation Coma Berenices, the tail probably passing over or near Arcturus. Early in September the comet and its tail will both pass below our horizon, still as bright as Coggia's comet at its best."

Prof. Swift says, under the same date: "Of course it is impossible yet to predict with certainty, but it would seem as if it would eclipse the glories of Comet B" (Gould's Comet).

RECENT INVENTIONS.

Mr. Nelson Herrick, of Champlin, Minn., has patented an improved truss for the relief of hernia and for similar purposes. The invention consists in a novel construction of a frame or band for carrying the pads, and a novel construction and combination with said frame and pads of elastic stems or shanks for connecting the pads to the frame.

An improvement in sap spouts has been patented by Mr. George J. Record, of Conneaut, O. The object of this invention is to strengthen sap spouts against injury when inserting them in a tree and removing them therefrom, also to insure security in suspending the sap pails.

An improved bee-hive has been patented by Mr. William K. Lindsey, of Central, S. C. The object of this invention is the production of a bee-hive of simplified construction, and one which is thoroughly protected against worms, ants, and all other creeping insects. The invention consists of the hive constructed with passages in combination with removable plates of glass and springs or similar means for holding the plates of glass in place.

An improved device for attaching the trace to the hame tug has been patented by Mr. Seth D. Bingham, of South Toledo, O. The invention consists in a wedge-shaped or beveled block or plate provided with a stud on its upper surface and with side arms surrounding the longitudinal bars of an oblong frame, so that it can slide in this frame, which has its outer end bent upward, and its inner end is attached to the hame tug. The end of the trace passes through the outer bent end of the frame and rests on the slide, the stud of which passes through it.

An improved cotton elevator has been patented by Mr. William F. Newton, of Valley View, Texas. The object of this invention is to facilitate the delivery of cotton to the gin, and at the same time to remove from the cotton the gravel and other foreign substances that may be in it, thereby preventing injury to the gin and causing it to deliver the cotton in better and cleaner condition.

An improved indicator lock has been patented by Mr. Austin Leyden, of Atlanta, Ga. This invention consists in constructing a lock in such manner that, in applying it to freight cars of railroads and to similar purposes, the car may be locked for through freight, and the destination of the car be indicated by a letter shown on the lock, and so that a way-freight key for the same lock will not open it.

An improved cover for coffee pots has been patented by Mr. John McAnespey, of Philadelphia, Pa. The invention consists in providing the cover with a perforation, which perforation is covered by a housing containing a ball, which acts as an automatic valve for retaining the aroma of the coffee and for admitting air to the pot while pouring the coffee.

An improved horse-detaching device has been patented by Mr. John E. Anger, of Albany, N. Y. The object of the invention is to provide certain improvements in thills which are so constructed that the horse can be released from the vehicle at will, permitting the thills to drop and the wagon to run forward until it meets with sufficient obstructions to check its progress, the thills being prevented from plowing into the ground by cushions attached to their forward ends.

An improved glove-button fastening, patented by Mr. S. Oscar Parker, of Littleton, N. H., has a tubular shank with a sharp edge; in the end of the shank a short tubular piece, having its outer edge turned outward, is driven after the shank has been passed through the glove material. The sharp edges of the shank are also turned outward and into the hollow ring formed at the outer end of the tubular piece by turning the edge outward. Wide washers may be interposed between the shoulders of the button and the glove.

Mr. Joseph Watts, of Coalburg, Ohio, has patented an improved device for preventing the loosening of nuts by continued shocks or vibrations. The invention consists in a nut provided with a projection on the inner surface, this projection fitting in a corresponding aperture in a washer provided with one or more projections on the inner surface, which projections snap into grooves in the outer surface of an additional washer placed against the object held by the bolt, this grooved washer resting against flanges or projections of the object united, or one of its corners are bent over to prevent rotation of this inner washer-plate, and consequently of the outer washer-plate and the nut.

An improved method of ornamenting the surface of jewelry, etc., has been patented by Mr. Willis H. Howes, of New York city. The object of this invention is to facilitate and cheapen the ornamentation of buttons and other articles of jewelry. It consists in coating the surface of the article to be ornamented with borax and water or other flux, applying a layer of suitable solder filings, a layer of filings of gold or other metal, and another layer of solder filings, and heating the article sufficiently to melt the solder and fasten the gold filings in place.

An improved device for registering the games and the points thereof in whist and other games has been patented by Le Roy B. Haff, of Englewood, N. J.

An improved buckle attachment has been patented by Mr. Robert A. Chapman, of Glymont, Md. The invention consists in a U-shaped frame with a loop at the end for receiving the central or end transverse piece of the buckle that is to be held to the strap, the strap being passed longitudinally into or through the U-shaped frame which is secured to the strap by means of rivets or by means of a swinging tongue pivoted on the frame and passing through a suitable aperture in the strap.

Mr. George Bradish, of Bay Side, N. Y., has patented an improvement in burners for burning paint from wood and metal work. It is so constructed that the paint can be softened and removed from a panel without affecting the moulding, and from a moulding without affecting the panel, from surfaces of any shape, and from crevices, and that may also be used for burning the putty from window sash without affecting the sash rails.

An improved snell for fish hooks has been patented by Mr. M. D. Beach, of Litchfield, Conn. The invention consists in a wire stem attached to the end of the snood and provided with a loop that is passed through the eye of the fish hook, and is then closed by means of a nut that is screwed on the stem and over the looped end of the same.

Safety Nitro.

The *San Francisco Bulletin* gives an account of the completion and inspection by its officers and shareholders of the Safety Nitro Company's Works at Pinole Point, on San Pablo Bay:

"In the main building are four furnaces in which sulphur and nitrate of soda are burned for the manufacture of sulphuric acid. The fumes are conducted by means of a pipe 28 inches in diameter into two tanks located on the upper floor of the building adjoining, each of which is 20 feet long, 16 feet wide, and 13 feet in height. Into these tanks steam is introduced by means of a pipe 1½ inches in diameter, leading from the engine-room, some 30 feet distant. The tanks are made of lead, 1-32 of an inch in thickness, and supported by wooden scantlings. From these tanks a 1-inch pipe leads to another building, in which the surface-heater is located. The surface-heater is a flat tank, 18 feet long, 7 feet wide, 12 inches deep, and made of very thick lead. Into this open tank the sulphuric acid is conveyed by means of a pipe, while a fire is continually sweeping over its surface. From the tank the acid is conveyed into an adjoining building, into glass retorts. The acid, after its concentration, is never allowed to cool; the retorts are put to the highest test of heat, after which the acid is allowed to cool and put into carboys. The process is continually in operation. The amount manufactured at present is 120 carboys per day.

In another building are the retorts for the manufacture of nitric acid. Fifteen thousand pounds a day are at present made. Nitro-glycerine is also made. Several experiments were made by Dr. Dean. Eight grammes of black powder were put into a lead cone and set off, without any injury to the cone. He then took a cone, in which two grammes of nitro were put, which, on being exploded, slightly bulged the cone. Taking, however, two grammes of nitro and eight grammes of common black powder, the effect of the explosion was a complete demolition of the cone.

The experiments were considered very satisfactory as establishing the force when mixed and the safety of these explosives when separate.

Large Locomotives for the West.

The Rhode Island Locomotive Works have lately finished and shipped for New Mexico the first installment of an order for ten monster locomotives for the Atlantic and Pacific Railroad Company.

These locomotives when in running order will weigh 60 tons each, and the tanks have a capacity of 3,500 gallons of water. The tenders weigh 35 tons each. The length of the locomotives over all is 60 feet. The cylinders are 20 inches in diameter, with 26 inch stroke. There are four pairs of couple drivers 50 inches in diameter and one four wheel truck. The fire box is 10 feet long and 43½ inches wide. The boiler is 58 inches in diameter, wagon top, and contains 200 2¼ inch tubes. There are a set of steam gauge cocks for the fireman located at the back head of the boiler, and another set for the engineer, inside the cab. The tops of the cabs of these locomotives are higher than the smoke-stacks of the engines used on the Eastern railroads. The height of the smokestacks from the top railing is 16 feet 6 inches. Either hard or soft coal can be burned. The great size and weight of the engines are made necessary by the heavy grades they will have to overcome.

Silk Mills in Philadelphia.

Philadelphia is becoming a notable center of silk manufacture. Sixty silk factories are counted by the *Times*, nine of them spinning mills. The others running looms produce a great variety of silk goods. The product of the sixty mills for the year ending June 30, 1881, was valued in round numbers as follows:

Upholstery coverings	$2,000,000
Chenille fringes and dress trimmings	2,000,000
Other fringes and tassels	1,500,000
Dress silks	500,000
Ribbons	250,000
Total	$6,250,000
Spun silk	1,000,000
Aggregate	$7,250,000

Postage Stamps.

Postage stamps are printed from engraved plates under a hydraulic press on paper especially prepared for this purpose.

Two hundred stamps are printed on one sheet at each motion of the press. The colors used in the inks are ultramarine blue, prussian blue, chrome yellow and prussian blue (green), vermilion, and carmine.

The sheets are gummed separately; they are placed back upward upon a flat wooden support, the edges being protected by a metallic frame, and the gum—composed of an aqueous solution of gum dextrine with a little acetic acid and alcohol—is applied with a wide brush. It dries quickly, and then the sheets are pressed. Each sheet is cut in half, and is then ready for the perforating machine.

This perforating machine was invented and patented by a Mr. Archer in 1852. The patent was purchased by the government for twenty thousand dollars. The perforations are effected by passing the sheets between two cylinders provided with a series of raised bands which are adjusted to a distance apart equal to that required between the rows of perforations. Each ring on the upper cylinder has a series of cylindrical projections which fit corresponding depressions in the bands of the lower cylinder; by these the perforations are punched out, and by a simple contrivance the sheet is detached from the cylinders in which it has been conducted by an endless band. The rows running longitudinally of the paper are first made, and then by a similar machine the transverse ones.

The sheets are finally subjected to heavy pressure, by which the roughness caused by the punching operation and other manipulations is removed.

The Ill-fated Dotterel.

It will be remembered that a few months ago the British ship of war Dotterel, while quietly lying at anchor in the Straits of Magellan, suddenly blew up and sank, only a few individuals of the entire crew escaping alive. None of the survivors had any knowledge of the cause of the explosion; people on shore and on other vessels near by, who witnessed the catastrophe, believed it to have been occasioned by the firing of the magazine in some unknown manner. A British war vessel, with divers on board, has lately been sent to the spot, and a preliminary examination of the wreck has been had.

The divers found the Dotterel sunk in nine fathoms of water, her bows being toward the west and her stern toward the east, but with an open space of about 20 meters between the two. It is believed that owing to the explosion the ship was broken in two, the stern separating from the body of the vessel, all the part of which occupied by the engines is completely knocked to pieces. The base upon which the boilers rested appears still to occupy its proper position, but of the boilers themselves there is not a trace remaining. The whole stern part, from the mizzen mast backward, is intact. On either side of the stern are boats, well secured on their davits, and hanging from the stern is the captain's gig, in a perfect state of preservation. A great many corpses are scattered over the deck, not all of which are complete, and some being only fragments of bodies. Up to the present about fifty have been seen, but the divers have not yet been able to inspect the state rooms, where it is supposed there will be some more. The hull of the Dotterel was almost covered with small fish of different kinds. It is intended to take up the bodies and have them decently buried as soon as the coffins are ready on shore. It is now believed that the occasion of the explosion was the bursting of the boiler, but how that could have reached the magazine is still a mystery, and is likely to remain so, those who might have explained it being the first victims.

A Steam Passenger Catamaran.

The new steam catamaran which John Evertsen, of Troy, N. Y., is intending to put on the route between Westerly and Watch Hill as a passenger boat, lately arrived at Providence, so says the *Journal* of that city. She is of very light draught, of only forty-five tons burden, with hull sixty feet long and beam six feet, and a carrying capacity of over 400 persons. The following are some of the novelties of her construction: First, the propeller, which is hung amidships and between the hulls of the vessel, the power being supplied by a double engine; second, the manner of working the engine, which the pilot does from the pilot-house, where a starting lever and reversing lever are located, dispensing with customary signals by bells, though the services of an engineer are required for all other purposes. There are two decks, main and promenade. On the former, which is elliptical in form, are the cabin, engine and boiler-room, and the steward's pantry, with a broad sheep-path all around, and rail of usual height. A companionway leads to the upper deck, which is broad and open, with only the pilot-house and captain's room to break the space. How fast the boat is, is yet to be shown. The owners claim that this is the first boat of its class to which steam has been successfully applied, four having been previously built, none of which operated satisfactorily.

A Trap for Sheep-killing Dogs.

The Lynchburg *Virginian* describes an ingenious trap devised by a Virginia farmer to capture sheep-killing dogs. Having suffered severely from the depredations of dogs upon his sheep-fold, he built around a number of sheep that dogs had killed an inclosure of rails twelve feet high and about ten feet square at the ground, the sides of the trap sloping inward until an opening was left about five feet square. Any dog could easily climb such a sloping fence and enter the pen, but not even a greyhound could jump out of it. In three nights the farmer captured forty-six dogs, including fifteen or twenty that had never been seen before in that neighborhood. This, after there had been a public slaughter of all dogs suspected of sheep-killing, save one, whose master could not be convinced of his guilt. The trap was built for his especial benefit, and it caught him the first night.

INVENTIONS.

A means for preserving the vertical position of vehicle springs in their up-and-down movement when the vehicle is in motion, and also for preventing the breaking of the springs, has been patented by Mr. August Reinwald, of Gallipolis, O. The invention consists in a novel construction, arrangement, and combination with the vehicle body and springs, of two plates, and devices connected therewith and with the vehicle body and springs.

An improvement in the class of machines adapted for removing stones, dirt, etc., from peanuts, and also for polishing and assorting them, has been patented by Messrs. Charles W. Nicholson and Richard H. Leigh, of Assamoosick, Va. The improvements consist, first, in the construction of the cleaning cylinder, through which the peanuts are passed to remove foreign substances; second, in the construction and arrangement of a spout and chute for facilitating and regulating the action of a blast on the nuts; and, third, in the construction of a flexible belt or apron, which is armed with bristles for use in polishing the nuts.

Mr. James A. Davidson, of Cow Bay, Nova Scotia, Canada, has patented an improvement in instruments for sea-sounding, by which the depth of water is read from a graduated scale upon the instrument instead of by the length of the line. By this invention soundings can be taken while the sailing vessel or steamship is in motion as quickly as if the ship were at rest. The principle upon which the depth is found is by the weight of water due to its height, the weight being equalized by compressed air and the power of a spring. The indicator is provided with a heavy end, which keeps it upright in its descent and confines the air, which becomes compressed until an equilibrium is found, and at that moment a spring closes a valve and stops the admission of water, so that if the indicator becomes inverted or falls horizontally the air cannot escape or take in water.

Mr. John Meissner, of New York city, has patented an improved car brake, which consists of a horizontal frame having bowed or curved end bars and provided with side sockets for holding the brake shoes, the frame being held in position against the bottom of the car by longitudinally movable end clamps or racks in such manner that it is free to accommodate itself to the relative positions of the wheels on curves in the road, said clamps or racks being connected with brake rods or shafts, whereby the frame may be moved longitudinally for applying or turning off the brake.

Levee Building on the Mississippi.

Mr. William L. Murfee, Sr., in *Scribner's Magazine*, thus describes the modern method of building a levee: The space which it is to occupy is first carefully cleaned off; trees, roots, stumps, logs, weeds, even grass and leaves are removed. Then in the middle of the space, extending longitudinally the whole length of the proposed work, is dug a ditch three feet wide and three feet deep, which is to be straightway filled up again. This is called a mock ditch, or as some people say, a "muck ditch," but why "muck," is one of the things that has not yet been found out. The object of this is twofold—to close all root holes and to mortise the superstructure into the natural earth, thus preventing any sliding under the pressure of the water. As the levee is built of loose earth, its mass coalesces with the loose earth with which the mock ditch was filled, and when the levee has been completed and settled it forms, with the contents of the mock ditch, a homogeneous mass anchored three feet all along the line in the solid ground. The next process is to build the levee. The material is to be taken only from the outside, or side next to the river, and should not be cut nearer than twenty feet from the base of the levee; the earth is carried in wheelbarrows upon run plank. The dimensions of levees have varied from time to time, according to the amount of funds available for their construction. In any case the top of the levee should be three feet perpendicular above high water mark; the base line should be five, six, or seven feet, according to the ratio in force, for every foot of perpendicular height; the top should be level, and as broad as the levee is high. Thus, where high water mark is four feet above the level of the natural bank, the perpendicular height of the levee should be seven feet, the breadth at the top should be seven feet, and its thickness at the bottom 35 feet, 42 feet, or 49 feet, as the ratio of five to one, six to one, or seven to one might be in force. Taking for illustration, a seven foot levee constructed upon this last ratio, it will be observed that with the water standing four feet deep, there will be on a horizontal line 25 feet of solid earth between the surface of the water outside and the air inside, and 49 feet between the bottom of the water without and the air at the natural surface of the earth within. The last but indispensable step in the process of levee building is the "seep water" ditch, which is dug some thirty or forty feet from the inner margin of the levee and parallel with it. The function of this ditch is to receive and conduct away the seep water, or transpiration water, which oozes in considerable quantities through even the most compact of levees. If permitted to remain it would render the ground about the inner base of the levee intolerably muddy, and would operate as a great disadvantage in case of emergency. The seep water ditch must be connected with plantation ditches or otherwise put in communication with the swamp in the rear, so that the water can be carried away. Finally, as a finishing touch to the new levee, it should be planted with Bermuda grass. If tufts of this grass be set two or three feet apart all over the surface of the levee, it will in a year or two cover it completely with a very dense sod, and by its interlacing roots add materially to its water-resisting capacity. When water stands for a long time against a levee, the current and the waves seriously abrade its surface, cutting in sometimes so deep that an inopportune wind storm would assuredly break it. A heavy coat of Bermuda sod is a very efficient preventive of this kind of disaster. I have seen at the end of a long period of high water, a piece of levee deeply indented all along the line, and in some places cut more than half through, while adjoining it was a strip of Bermuda covered levee, subject to the same exposure to wind, wave, and current, which had not apparently lost a pound of earth or a tuft of grass.

Hardening Steel.

The effect of occluded gases in iron and steel is now being carefully studied by metallurgists in general, and a committee of the Institution of Mechanical Engineers recently raised the question in one of its reports as to whether the hardening and tempering of iron and steel might not be produced by the expulsion of occluded gases during the heating process and their subsequent exclusion by the sudden cooling and contraction. Professor Chandler Roberts has undertaken to answer this question, and by heating rods and spiral wires of steel *in vacuo* by means of the electric current, and suddenly quenching them in cool mercury, he demonstrates that steel will harden when there are no gases to absorb. The metal was, of course, robbed of its occluded gases by means of an air pump connected with the vacuum chamber, and the parts which were quenched in the mercury were found to be glass hard, while those which did not reach the cold fluid were found to be quite soft. Professor Roberts, therefore, concluded that gases do not play any part in the process of hardening and tempering. Professor Hughes, who has made numerous experiments on the subject, believes that the temper of steel is due to the chemical union of the iron with the carbon. At low temperatures this union takes place only in a slight degree, and hence in soft steel we have the carbon keeping aloof from the iron; but as the temperature is raised the combination is furthered, until, in the case of gray or glass hard steel, we have really a kind of diamond alloyed with iron. Sudden cooling is necessary to fix the combination, for in slow cooling the carbon separates from the iron. This theory is a very promising one, and is supported by a variety of facts; Mr. Stroh, for example, having observed that when an electric spark passes between two iron contact pieces and fuses them the fused part becomes diamond hard, and will scratch a file.—*Engineering.*

Mosquitoes.

Mr. Ivers W. Adams writes from Bathurst, N. B., to *Forest and Stream*, that he tried a dozen prescriptions for repelling mosquitoes, flies, and similar pests, and found none of them effective until he came across the following, which are dead sure every time:

"Three oz. sweet oil, 1 oz. carbolic acid. Let it be thoroughly applied upon hands, face, and all exposed parts (carefully avoiding the eyes) once every half hour, when the flies are troublesome, or for the first two or three days, until the skin is filled with it, and after this its application will be necessary only occasionally. Another receipt, equally efficacious, is: Six parts sweet oil, one part creosote, one part pennyroyal. Either of these is agreeable to use, and in no way injurious to the skin. We have both of these in our camp with us, and all flies keep a safe distance."

Bells on Sheep.

Mr. James S. Grinnell, writing in the Springfield *Republican* of bells on sheep as a protection against dogs, gives this illustrative experience:

"A good farmer in Leyden, who keeps about a dozen excellent Southdown ewes, always belled, was grieved and surprised one morning to find that dogs had raided his flock, killed two, mangled others, and scattered the rest. On collecting his little flock into the yard after a day's search he found that the tongue was lost from the bell. This was replaced, and never since have his sheep been worried. The experiment is so simple and cheap that it is worth trying."

How to Come It Over Hornets.

Mr. James T. Bell's account, in the Canadian *Entomologist*, of the easy capture of hornets may possibly serve as a useful hint to some agricultural reader in an emergency. The nest was unexpectedly found in a stump during a walk in the Belleville forest:

"A few days after, taking advantage of a cool morning, I sent my two boys to the woods with a small bottle of chloroform and a hard rubber syringe. According to directions, they injected about a drachm of the liquid into the hole, and threw a handkerchief over the entrance. In about five minutes they opened up the nest, when they found the inmates in a perfect state of slumber, and transferred them without trouble to their cyanide bottles. In about an hour they returned, bringing me forty-eight specimens of the insect."

Jetty Lights.

Experiments with the electric light have been lately made by MM. Dalmin, at Barcelona, on the mole or jetty head of San Ramon. Five electric lamps were used, the wire passing to each in succession, but, at the last lamp, instead of returning to the machine, the wire was brought down into the ground and to the sea, at about 8 meters distant, an arrangement (says *La Lumière Electrique*) completely new and original, and we call attention to it as realizing considerable economy in illuminating with the electric light at a great distance. The electric machine used was one of the Gramme system, a new type patented in October last, and meant specially for division of the electric light. The system, which seems to have given satisfaction, was exhibited in various other parts of Barcelona.

Eruption of Mauna Loa.

Late advices from Honolulu, Sandwich Islands, describe increased activity of Mauna Loa, with great hazard to the port of Hilo. The new outbreak is described by an eye-witness as follows: "About June 22 the old mountain was observed to be more than usually active, the whole summit crevasse pouring forth immense volumes of smoke. By Friday noon the three southern arms had all joined into one, and rushing into a deep but narrow gulch, forced its way down the gulch in a rapid flow. By Saturday noon it had run a mile. The flow was on an average 75 feet wide and from 10 to 30 feet in depth, as it filled the gulch up level with its banks. The sight was grand. The whole frontage was one mass of liquid lava carrying on its surface huge cakes of partly cooled lava. Soon after we reached it the flow reached a deep hole, some 10 or 15 feet in depth, with perpendicular sides. The sight, as it poured over that fall in two cascades, was magnificent. The flow was then moving at the rate of about 75 feet an hour. If it goes through Kukuau, probably all the lower or front part of the town will fall a prey to Madame Pele."

Bishop Coan, of Hawaii, writes from Hilo, under date of June 28: "The northern wing of the line is less than six miles from us, and the southeastern is less than two miles distant, while the center of the line appears the most sanguinary. From the southeast wing the seething fusion has fallen into a rough water channel, 20 to 50 feet wide, which comes down from the main bed of the flow almost direct to Hilo. We found two streams of liquid lava coming down in rocky channels which are sometimes filled with roaring waters, but nearly dry at this time. These two gulches are too small to hold the seething fusion, and the fiery flood overruns the banks and spreads out on either side. The united width of these streams may vary from 50 to 200 feet."

Two days later the venerable Bishop described the lava stream, which was approaching Hilo, as "fearfully active. It is about 50 to 100 feet wide where it is confined in the gulches, but it is sure to spread indefinitely where there is space. By night the sanguinary glow is fearful, like a flaming banner lifted high in the heavens. Some days its progress toward us is one-eighth to half a mile a day. From the town you can walk up to the lava stream in 40 minutes, and return in 30. Thousands of people visit it, sometimes a hundred in a day. I have been up to it, and dipped up the fusion. As it comes down the rocky bed of the ravine the roar of the lava is like that of the Wailuku River in flood, but a heavier and deeper sound; it is the bass, and the other the tenor. Sometimes the sound is like distant thunder. Its explosions and detonations are rapid and startling. I counted ten in a minute. In some places it has overflowed its banks and spread out 200 or 400 feet laterally, burning the jungle and cutting down the trees.

"We now expect the lava stream to enter Hilo Harbor in a few days. What damage it will do there remains to be seen. Should it spread out when it reaches the low and level parts of Kukuau and Punahawai, joining Punahoa, where we live, it may burn many houses and cut our village in two, but Hilo will not be entirely destroyed unless the vast masses of fire that are accumulating upon the mountain slope should come down upon us."

The Hawaiian *Gazette* of July 6 says: "The past week has been one of great excitement in Hilo, in consequence of the renewed activity in the volcanic fires on Mauna Loa. One arm of the fiery stream has pushed itself into the Kukuau gulch, and is within three miles of the village of Hilo. All Hilo may be said to have visited the flow during the last few days. Men, women, and children, some on foot and some on horseback, have made the pilgrimage. As seen on Wednesday, June 29, it presented a view never to be forgotten. A mile above the lower end of the stream the lava was flowing in a liquid, living torrent, some 30 feet wide along its course, consuming everything in its way. From this point about half a mile of the seething, surging torrent could be seen. The belt covered with lava was some 500 feet wide, all hot and liable at any moment to break out into renewed activity. At night the scene was awfully grand beyond description."

Skull Measurements.

Professor Flower, the well-known English anatomist, has published some further results of his researches with reference to the human skull. He states that the largest normal skull he has ever measured was as much as 2,075 cubic centimeters; the smallest, 960 cubic centimeters, this belonging to one of those peculiar people in the center of Ceylon who are now nearly extinct. The largest average capacity of any human head he has measured is that of a race of long flat-headed people on the west coast of Africa. The Laplanders and Esquimaux, though a very small people, have very large skulls, the latter giving an average measurement of 1,546. The English skull, of the lower grades, shows 1,542; the Japanese, 1,486; Chinese, 1,424; modern Italian, 1,475; ancient Egyptian, 1,464; Hindoos, 1,306.

Business and Personal.

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

Cheapest Portable Forges. H. Crumlish, Buffalo, N.Y.

Wanted—A Machine for Hackling Corn Husks for making Mattresses. For particulars, address M. Otterbourg, Wilmington, N. C.

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

If your brain is overworked, relieve it by the use of Van Beil's "Rye and Rock."

Correspondence with parties wishing to invest in manufacturing business, now established and requiring more capital, is solicited. Address Box 186, Norwood,N.Y.

The city of Natchez is contemplating the erection of water works, and solicits communications and estimates from parties engaged in that line. Address Henry C. Griffin, Mayor, Natchez, Miss., Lock Box 258.

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

To Lease.—65 horse water power; unfailing; midway between N. Y. and Phila.; railroads, freights, and facilities unequaled. Address John Outcalt, Spotswood, N.J.

Save cost of fuel and water, repairs, explosion, burning, compounds, delays, cleaning, and all other evils of impure water, by using Hotchkiss' Automatic Mechanical Boiler Cleaner. 84 John St., N. Y. Send for circular.

The scientific principles involved in the manufacture of the Boomer & Boschert Cider Press will convince every one manufacturing cider that these presses are the best in the world. The prices are very reasonable. Send for illus. cata. to the New York Office, 15 Park Row.

Party owning Sash, Door, and Blind Factory, wishes to add to his manufacture some Specialty (a good patent preferred) which will meet with large and profitable sales. Address X. Y. Z., Box 672, New York city.

Agricultural Engines for sale cheap by S. J. Benedict, East Randolph, N. Y.

Peck's Patent Drop Press. See adv., page 76.

For Sale.—Turret Lathe, with Chaser Bar. No. 1 and 4 Root Blowers. B. & W., 261 N. 3d St., Phila., Pa.

Tarred Roof'g, Sheath'g Felts. Wiskeman, Paterson, N.J.

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

Walrus Leather, Walrus Wheels, Pure Turkey Emery Star Glue for Polishers. Greene, Tweed & Co., N. Y.

List 26.—Description of 2,500 new and second-hand Machines, now ready for distribution. Send stamp for the same. S. C. Forsaith & Co., Manchester, N. H.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Punching Presses & Shears for Metal-workers, Power Drill Presses, $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co.,115 S. Liberty St., N.Y.

Improved Skinner Portable Engines. Erie, Pa.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

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

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Cope & Maxwell M'f'g Co.'s Pump adv., page 45.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

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

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N.Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 261 Jefferson St., Philadelphia, Pa.

For best Duplex Injector, see Jenks' adv., p. 60.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

4 to 40 H. P. Steam Engines. See adv. p. 61.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 78.

Houghton's Boiler Compound contains nothing that can injure the iron, but it will remove scale and prevent its formation. Houghton & Co., 15 Hudson St., N. Y.

Long & Allstatter Co.'s Power Punch. See adv., p. 77.

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

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 77.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Telegraph, Telephone, Elec. Light Supplies. See p. 93.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 94.

Safety Boilers. See Harrison Boiler Works adv., p. 53.

Elevators, Freight and Passenger. Shafting, Pulleys and Hangers. J. S. Graves & Son, Rochester, N. Y.

Saw Mill Machinery. Stearns Mfg. Co. See p. 78.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Gould & Eberhardt's Machinists' Tools. See adv., p. 93.

Blake's Patent Belt Studs. The strongest fastening for leather and rubber belts. Greene, Tweed & Co., N.Y.

The Medart Pat. Wrought Rim Pulley. See adv., p. 93.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 93.

Barrel, Keg, Hogshead, Stave Mach'y. See adv. p. 93.

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad. p. 94.

See Bentel, Margedant & Co.'s adv., page 93.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 93.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 94.

For Machinists' Tools, see Whitcomb's adv., p. 94.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 93. Totten & Co., Pittsburg.

Silica Paints (not mixed); all shades. 40 Bleecker St., N.Y.

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

The None-such Turbine. See adv., p. 78.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

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

Sewing Machines and Gun Machinery in Variety. The Pratt & Whitney Co., Hartford, Conn.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

(1) W. Z. writes: I have a glass vase, 16 inches high, 6 inches in diameter, and an eighth of an inch thick. How can I cut this glass into hoops or rings, each measuring 1¼ inches in height? A. Paste a band of thick paper having a smooth edge around the vase so as to mark the line to be cut, and use a good glazier's diamond, the edge of the paper serving as a guide. When cut draw a hot piece of glass rod over the mark, and the ring will separate without breaking. Experiment on a bottle first.

(2) J. C. asks (1) for a recipe for making carbon paper for working the manifold process of copying letters, etc. A. Melt together ten parts of lard and one of wax, and mix with it a sufficient quantity fine lampblack, or lampblack and black lead (graphite). Saturate the paper (unglazed) with this composition, remove excess, and put in a press. 2. Also, how a stylus can be made or got? Will a lead pencil serve the purpose as well? A. A hard pencil will answer, but a stylus of ivory, bone, or steel is preferable.

(3) C. C. L. asks: What is the best machinery in use for manufacturing boneblack? A. A simple crusher, an upright retort furnace, and a variety of sieves constitute the principal part of the plant. See Knight's "New American Mechanical Dictionary," and Hints to Correspondents.

(4) H. E. D. writes: Wood engravers have long felt the want of a simple, reliable, and expeditious formula for photographing on wood for engraving. There are two or three parties that claim to have forms of doing it, but keep them secret. Now, if you could publish anything in the way of a new simple formula, with illustration of special style of printing frame that would be required, you would confer a favor on a number of your readers. A. The subject of photographs on wood for engraving has been treated most comprehensively in the paper by Edward Pocock, in SUPPLEMENT, No. 58.

(5) G. F. asks (1) for a simple method of testing white paints (water colors) to find if they have a lead basis. A. Dissolve a fragment of sodium or potassium in a small quantity of water, add a few drops of dilute sulphuric acid, and hold over the vessel containing the liquid a strip of paper on which is spread some of the moist pigment. If it contains lead it will blacken at once. 2. Will Chinese white (in cakes) turn black by exposure to atmosphere and light? A. If the air contains hydrogen sulphide, yes; not otherwise.

(6) W. K. writes: I want a soft and tough composition that would take the impression of grain from one board to another. A. Try gutta percha softened by hot water or steam; or use fusible metal.

(7) J. N. S. writes: I noticed your advice about using galvanized iron for culinary purposes. I had just purchased a small galvanized wine press, intending to use it also for plum jelly, etc., but never did, as your warning has often been repeated. As the season is now upon us for making up such things, my wife wishes to use the press. Will you please inform me by what simple method I can destroy the coat so as to be safe in using? A. The zinc coating may be removed by scouring with silicious sand well moistened with muriatic acid diluted with three volumes of soft water.

(8) S. G. M. writes: I want to know if there is not some chemical that will fix the lime in whitewash and keep it from washing off by rain and rubbing off by wear. I am aware that milk is used, but it is too expensive here. A. See "A Durable Whitewash," page 52, current volume. Water-glass has been used in this connection with fair results.

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

N. D. S.—Traprock and limestone.—S. & P.—Sulphide and arsenide of iron—pyrite and arsenopyrite.—J W. M.—(Two samples). Feldspathic rock, hornblende, and mica schist, carrying a considerable quantity of graphite (plumbago, black-lead.)—E. P.—Your letter contained no minerals, as stated, please send other samples.—L. G. C.—The red is jasper, the other quartz and chalcopyrite—iron-copper sulphide.—Several unlabeled packages of minerals have been received without letters by which we can identify the senders.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

July 12, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 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. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Air compressor valve, E. Hill 244,127
Air compressors, cold air attachment for, E. Hill. 244,128
Alarm. See Burglar alarm.
Album, photograph, Binnechère & Cochard 244,357
Amalgamating metals, process of and apparatus for, C. C. Beers 244,028
Amalgamator, ore, W. H. Howland 244,240
Appliance for enabling persons to remain under water or in vitiated air, H. A. Fleuss 244,043
Axle bearing, car, J. R. Baker 244,107
Axle lubricator, J. V. Randall 244,299
Bale tie, J. W. Means 244,140
Baling tie, J. Murtry 244,068
Battery. See Thermo-electric battery.
Bed bottom, spring, W. P. Hennion 244,055
Bed, hospital, D. J. Powers 244,073
Bed lounge, G. Snyder 244,330
Bed lounge, Snyder & Krause 244,329
Bed lounge, C. Stengel 244,085
Bed, etc., spring, G. W. Haskins 244,332
Belt clasp, waist, L. Sanders 244,149
Belt replacing device, G. P. McConnell 244,279
Belt shipper, S. Strunz 244,336
Binder, temporary, G. H. Reynolds 244,307
Bird cage, J. J. Nichols 244,284
Blacking box, H. P. Stichter 244,334
Blast furnaces, process of and apparatus for cleansing and utilizing waste gases of, J. Reese 244,075
Boiler. See Steam boiler.
Boiler furnace, steam, C. I. Hall 244,051
Boiler indicator and signal, J. G. Logan 244,267
Boilers, apparatus for cleaning, T. J. Jones 244,249
Boot and shoe nailing jack, J. Smallwood 244,083
Boot and shoe sole edge trimmer, Z. Beaudry 244,027
Boot and shoe sole edges, machine for burnishing and setting, Bradford & Hutchinson 244,244
Boot and shoe soles, machine for inserting screw-threaded wire in, L. Goddu 244,046
Bottle wrapper, B. D. Marks (r) 9,797
Bottles, regulator for nursing, W. C. Carpenter 244,181
Box. See Blacking box. Journal box. Letter box.
Brake. See Car brake. Wagon brake.
Broiler, reversible, Johnson & Bigelow 244,060
Broiling by means of gas, apparatus for, G. W. Coleman 244,187
Bronzing machine, S. Crump 244,195
Burglar alarm, J. H. Luckhurst 244,064
Buttons, machine for making shoe, M. M. Rhodes 244,310
Calorification, process of and apparatus for dynamic, E. Hill 244,237
Cant dog, W. W. Hills 244,057
Capsule filler, J. P. Reymond 244,308
Car brake, H. Walter 244,343
Car, cattle, J. Rex 244,076
Car coupler, S. Farnam 244,213
Car coupling, Arter & Blocher 244,164
Car coupling, L. Caulk 244,182
Car coupling, G. Holforty 244,238
Car coupling, G. W. James 244,247
Car coupling, J. McCree 244,138
Car coupling, L. W. Stanley 244,332
Car heating apparatus, railway, W. C. Baker 244,108
Car moving device, C. D. Steinly 244,084
Car, stock, I. Kitsee 244,258, 244,259
Car, stock, C. J. Slafter 244,326
Car wheels, flask for moulding, W. Fawcett 244,214
Carbonating apparatus, frame for supporting, J. Matthews 244,275
Carding machine, J. Tyning 244,342
Carding machines, mechanism for stripping the flats of, W. H. Rankin 244,302
Carriage curtain fastener, T. M. Paschal 244,072
Carriage running gear, M. J. McCue 244,139
Case. See Leather case.
Casting belt hooks, pattern for, S. Budlong 244,110
Casting pipes and apparatus therefor, drying moulds for, J. K. Dimmick 244,199
Chair. See Folding chair. Railway chair. Nursery chair. Window cleaning chair.
Check book, B. Greensted 244,049
Christmas tree candle holder, J. W. & A. Geddes. 244,045
Churn, J. Gelhart 244,226
Cigar machine, W. M. Steinle 244,333
Clamp. See Saw clamp.
Clasp. See Belt clasp. Corset clasp.
Clock, electrical, D. F. Sweet 244,089
Clothes drier, T. G. Saint (r) 9,805
Clothes wringer, C. J. Shirreff 244,325
Clutch, friction, A. E. Tenney 244,091
Cock, lock, W. S. & A. D. Holden 244,130
Coffee and tea pot, J. G. Ewing 244,212
Coffin, H. Sander 244,317
Collar fastening, dog, J. M. Riley 244,312
Colters, hub for rotary, A. J. Manny 244,262
Concrete and artificial stone, apparatus for moulding, J. C. Sellars 244,322
Concrete, composition for moulds and composition mould for forming, J. C. Sellars 244,321
Cooking apparatus, steam, A. E. Campbell 244,190
Cooler. See Water cooler.
Corn husking machine, E. A. Bourquin 244,177
Corn shock compressor, W. M. Baldwin, Jr 244,166
Corset, D. H. Fanning 244,119
Corset clasp, Allen & Doolittle 244,022
Corset fastening, J. M. Beach 244,171
Cotton gin attachment, W. W. Compton 244,190
Cotton press, Z. F. Nance 244,283
Coupling. See Car coupling. Tube coupling.
Cradle, folding, C. A. Fenner 244,217
Cutter. See Straw cutter.
Decoy duck, J. Danz, Jr 244,038
Dental vulcanizing flask, J. S. Campbell 244,031
Disinfecting and renovating textile and other substances, apparatus for, F. H. Young 244,354
Diving apparatus, A. Khotinsky 244,062
Door check, S. A. Armstrong 244,102
Door spring, C. B. Clark 244,184
Drier. See Clothes drier. Fruit drier.
Drilling machine, multiple, T. T. Prosser 244,297
Dust pan, E. L. & M. A. Dietz 244,115
Electric cables, machine for the manufacture of, E. J. Frost 244,130
Electric plaster, Hubbard & Ashley 244,242
Electrical conductor, C. E. Ball 244,167
Electro-magnetic apparatus, M. G. Crane 244,035
Elevator. See Hydraulic elevator. Washing machine elevator.
Elevator, H. Baragwanath 244,168
Elevator bucket, J. S. Roberts 244,313
Engine. See Fire engine. Steam engine.
Envelope machine, H. D. & O. W. Swift (r) 9,800
Exhaust and ventilating apparatus, S. W. Hudson 244,243
Fan, S. Scheuer 244,319
Fare register and recorder, R. M. Rose 244,314
Faucets to barrels, device for attaching, P. Schofield 244,320
Feather renovator, H. E. Rowe 244,148
Feed water heater, I. B. Davis 244,039
Feed water heater, D. Sullivan 244,088
Fence post, N. Clute 244,112
Fence post, J. H. Helm 244,233
Fence wire, barbed, H. M. Rose (r) 9,798
Fencing, barbed iron, C. K. Marshall 244,274
Filter, G. Land 244,252
Fire engine, B. J. C. Howe 244,131
Fire escape, L. D. B. Shaw 244,323
Fish and animal trap, combined, J. S. Simpson 244,150
Flask. See Dental vulcanizing flask.
Flower pots, machine for making, G. W. Rathsam 244,304
Flue cleaning machine, F. W. Gordon 244,047
Folding chair, J. B. Fenby 244,216
Folding chair, E. S. Griffith 244,260
Folding table, E. J. Rawson 244,306
Framing machine, timber, I. Lepley 244,134
Fruit drier, J. Taylor 244,337
Fruit press, F. F. N. Marais 244,065
Furnace. See Boiler furnace. Hydrocarbon furnace.
Furnace grate, W. Brown (r) 9,795
Game apparatus for pool and billiards, portable, J. Sherman 244,324
Gas apparatus, J. Hanlon 244,231, 244,361
Gas, apparatus for making, Bell & Lipsey 244,173, 244,174
Gas, apparatus for manufacturing, Bell & Lipsey. 244,175
Gas, apparatus for manufacturing, A. B. Lipsey .. 244,266
Gas heater, C. E. Hequembourg 244,056
Gas producer, Narjes & Willmer 244,141
Gas tubing, manufacture of, S. Barr 244,170
Gases under pressure, receptacle for holding, W. M. Jackson 244,245
Gate. See Railway gate.
Gearing, T. T. Leacox 244,264
Generator. See Steam generator.
Glass chimney, globe, etc., F. M. James 244,246
Gold in ore, composition for dissolving the coating of, J. F. Sanders 244,080
Governor, steam engine, J. W. Peck 244,289
Grain drills, cleaner for the plow points of, J. Saurer 244,318
Graining machine, J. Hammerl 244,125
Grate, fire, A. C. Engert 244,211
Grinding mill, J. A. Moore 244,363
Hammer, lathing, H. G. Elliott 244,209
Hand guide for writing, L. M. Beebe 244,172
Harness pad plate, J. Thomas 244,338
Harrow, G. H. Johnson 244,248
Harrow, spring tooth, West & Chase 244,100
Hat bodies, machine for scalding and sticking fur to felt, E. A. Mallory 244,271
Hat, sunshade, G. W. Ross 244,315
Hats, machine for blocking and shaping, R. Eickemeyer 244,041
Hay press, J. March 244,272
Heater. See Feed water heater. Gas heater.
Hinge, B. S. Atwood 244,025
Hinge, coach, F. P. Pfleghar 244,293
Hinge, spring, Clark & Hart 244,185
Hinge, trunk, A. C. Frankel 244,119
Hog scraping machine, R. C. Tompkins (r) 9,799
Hoisting and conveying apparatus, C. S. Kershaw 244,061
Holder. See Christmas tree candle holder. Thread holder.
Hoop cutting machine, F. L. Wilson 244,155
Horse rake, W. J. Lane 244,263
Horseshoe nails, machine for making, J. A. Coleman 244,198
Hubs, machine for manufacturing carriage wheel, C. S. Tilton 244,097
Hydraulic elevator, E. Thayer 244,092
Hydrocarbon furnace, J. W. & J. R. Houchin 244,239
Hydrocarbon furnace, H. S. Saroni 244,081
Ice machine, T. L. Rankin 244,300
Indicator. See boiler indicator. Steam boiler indicator.
Insects from plants, machine for removing, R. Bollerman 244,176
Iron, manufacture of copper-plated sheet, C. Haegele 244,230
Iron, manufacture of galvanized, W. B. Spear 244,153
Jack. See Boot and shoe nailing jack.
Jail or prison, Brown & Haugh 244,358
Joint. See Rail joint.
Journal box, C. D. Crandal 244,192
Journal box, anti-friction, C. W. Pierce 244,294
Knife. See Tobacco knife.
Knitting machine cam, J. W. Rist 244,079
Knitting machine cam, A. Wrightson 244,353
Ladder, telescopic, F. W. Hofele 244,059
Lamp, E. S. Piper 244,141
Lamp, F. A. Taber (r) 9,801
Lamp, electric, H. S. Maxim 244,277
Lamp, electric, C. G. Perkins 244,291
Lamp globes, holder or socket for electric, O. Kartzmrak 244,255
Lamps, circuit closer for incandescent, W. Stanley, Jr 244,331
Land roller and attachment, A. C. Dilday 244,040
Latch, locking, A. Rand 244,298
Leather case, A. & H. Hoff 244,129
Leather finishing machine, F. B. Batchelder (r) ... 9,974
Leather splitting machine, C. Dancel 244,196
Letter box, C. Ginesi 244,227
Lever, straining, J. Corbit 244,034
Light. See Skylight.
Lock. See Nut lock.

Lock strike, J. H. Barnes 244,169
Looms, pattern chain bar for, G. Crompton 244,113
Lounge, T. Ramsden 244,093
Lubricator. See axle lubricator.
Magnet and armature, electro, T. A. Watson 244,347
Magneto-electric machine, J. Olmsted 244,297
Measuring and cutting machine, cloth, A. W. Judd 244,250
Meat slicing machine, G. W. Lower 244,270
Metal, electro-deposition of, P. Biggs 244,224
Metal vessels, machine for making rims for, W. W. Jones 244,250
Metals with zinc, coating, H. Roberts 244,146
Millstone dressing machine, C. D. Olmstead 244,296
Millstone face, G. A. Coles 244,189
Motor, T. Mayhew (r) 9,804
Mucilage bottle, E. Knapp 244,300
Music leaf turner, I. Moore 244,291
Musical instrument, mechanical, J. Mellamany, Jr. 244,069
Netting machine, A. T. Anderson 244,159
Nursery chair, folding, E. S. French 244,223
Nut cracker, M. Rens 244,145
Nut lock, F. B. Kendall 244,256
Oil press mat, Gandy & Brittain 244,121
Oils to burners, reservoir for holding and supplying volatile, H. Fritz 244,225
Ore grinding machine, W. H. Howland 244,241
Ore separator, L. De Soulages 244,114
Organ swell, J. H. White 244,351
Oven shelf, rotary, Youngs & Smith 244,255
Paddlewheel, J. W. Danforth 244,197
Padlock, B. J. Riley 244,311
Pan. See Dust pan. Warming pan.
Paper bags, machine for making seamless, C. E. Adams 244,156
Paper pulp, machine for treating, A. Forbes 244,220
Pasteboard boxes, pole for handling, J. H. Williamson 244,350
Pen, stylographic, A. T. Cross 244,194
Petroleum reservoir, G. Richter 244,078
Photographic plate holder, J. Thorpe 244,339
Piano action, Elliot & Spike 244,210
Pillow sham frame and holder, J. R. Adams (r) 9,793
Pin tongue, S. Moore 244,071
Piston, H. Waterman 244,345
Planing machines, reciprocating cylinder head for, J. C. & E. J. Pennington 244,290
Planter check rower, corn, G. W. Brown 244,178
Planter, corn, I. P. Watson 244,346
Plow, W. R. Bullock 244,179
Plow, F. T. Pinter 244,295
Plow and cultivator, combined, E. Atkinson 244,165
Plow, sulky, J. I. Hoke (r) 9,796
Post. See Fence post.
Pot. See Coffee and tea pot.
Power, mechanism for transmitting, E. L. Smith 244,152
Press. See Cotton press. Hay press. Fruit press. Printing press.
Presses, friction reversing gearing for, A. A. Gullett 244,050
Printer's chase and stereotype frame, combined, R. Atwater 244,024
Printing press, F. A. Harlow 244,053
Protector. See Stack protector.
Pulley, friction, W. D. Herschel 244,136
Pump bucket, M. D. Temple 244,090
Pumping artesian wells, apparatus for, W. Skinnen 244,151
Pumping attachment for barrels, F. I. Maule 244,276
Rail joint, A. W. Kimbrough 244,257
Rail joint, C. W. Levalley 244,265
Railway chair, J. W. Trout 244,341
Railway gate, D. Hamman 244,052
Railways, tension apparatus for cable, H. Root 244,147
Rake. See Horse rake.
Razor strop, J. R. Torrey 244,095
Refrigerating building, T. L. Rankin 244,301
Refrigeration and machinery for the same, system and method of supplying dynamic, E. Hill 244,236
Register. See fare register.
Rice beating and polishing machine, J. R. Sample 244,316
Rocker, adjustable, E. W. Andrews 244,104
Roller. See Sand roller.
Rudder, storm, C. O. Nyqvist 244,285
Sand moulding machine, J. D Delille 244,359
Sash balance, F. F. Westerfield 244,101
Sash cord fastener, Dunne & Rath 244,206
Sash weight, P. H. Griffin 244,123
Saw clamp, W. H. Johnson 244,251
Saws, device for sharpening band, G. W. Amesbury 244,158
Sawing machine, circular, D. O. Strifler 244,335
Sawing machine, drag, W. McAdams, Jr 244,273
Screw driver, ratchet, L. E. Rhodes 244,309
Scrubbing machine, G. W. McVay 244,280
Separator. See Ore separator.
Sewing machine, A. E. Choquette 244,333
Sewing machine, F. Wilhelm 244,102
Sewing machine attachment, E. T. Thomas 244,093
Sewing machine attachment, button hole, J. Katzenberg 244,254
Sewing machine binding attachment, I. L. Grinnell 244,124
Sewing machine, button hole, J. S. Freese 244,222
Sewing machine clutch, T. Carey 244,032
Sewing machine feeding device, C. B. True 244,096
Sewing machine presser foot attachment, F. S. Prescott 244,074
Sewing machine shuttle, H. C. Bailey 244,106
Sewing machine take-up, Lorinet & Aubertelle 244,268
Shoe, rubber, R. W. Wilber 244,349
Size or binding composition, C. G. Dodge, Jr 244,200
Skylight, J. M. Lutz 244,136
Spittoon, D. Arndt 244,163
Spring. See Bed spring. Vehicle spring. Door spring. Wagon spring.
Stack protector, adjustable, J. W. Hoek 244,058
Stamp mill ore feeder, E. W. Wagner 244,098
Staples, device for inserting metallic, H. R. Heyl (r) 9,803
Steam boiler, T. Critchlow 244,193
Steam boiler indicator, D. D. & J. Douds 244,204
Steam engine, P. Lochmann 244,135
Steam engine indicators, cylinder for, J. W. Thompson 244,094
Steam engines, wearing surface of, L. Perkins 244,292
Steam generator, T. & J. Clifford 244,186
Steam generator, water coil, D. Sullivan 244,087
Steam pipes, etc., covering for, R. H. Martin 244,066
Stocking or half hose and method of manufacturing the same, L. Woodward 244,352
Stone, artificial, D. G. Weems 244,348
Stool, camp, J. B. Fenby 244,215
Store counter seat, W. M. Corwin 244,191
Straw cutter, Gordon & De Garmo 244,228
Suppositories, machine for making, E. W. Bing 244,030
Table. See Folding table.
Tablet, writing, J. F. Dubber 244,205
Tap and faucet, barrel, E. T. Barlow (r) 9,802
Telegraph apparatus, induction, W. L. Silvey 244,082
Telegraph, duplex, S. D. Field 244,218
Telephone, J. A. Lakin 244,261
Telephone exchange instrument, E. T. Quimby 244,143
Telephone signal apparatus, Cheney, Jr., & Roper 244,111
Terret, harness, G. F. Eberhard 244,207
Tether, S. W. D. Green 244,122
Thermo-electric battery, P. Biggs 244,225
Thermometer, fever, F. Bahmann 244,026
Thrashing machine elevator, J. Harp 244,054
Thrashing machine feeder, J. Bansford 244,144
Thread holder and cutter, A. J. Winslow 244,103
Tie. See Bale tie. Railway tie.
Tin cans, device for the manufacture of, J. M. Ward 244,344
Tobacco knife, R. T. Joyce 244,252
Tobacco, machine for attaching tags to plug, A. Markert 244,273
Tongs, pipe, C. H. Lovrien 244,269
Toy, combination, G. H. Ireland 244,133
Toy panoramic car, G. H. Ireland 244,132
Traction wheel, T. T. Prosser 244,306
Trap. See Fish and animal trap.
Trimmer. See Boot and shoe sole edge trimmer
Truck for moving buildings, J. Minahan 244,070
Tub fastener, S. E. Moore 244,282
Tube. See Well tube.
Tube coupling, Allison & Hunter 244,157
Valve. See Air compressor valve.
Valve, balanced, P. Armington 244,161
Valve, rotary, A. Ehret 244,208
Valve, steam engine, P. Armington 244,160
Vault roof, H. Q. French 244,224
Vehicle for transporting live stock, S. D. Reynolds 244,077
Vehicle running gear, J. W. Walker 244,099
Vehicle seat shade, F. M. Mahan 244,137
Vehicle spring, M. L. Gardner 244,044
Vehicle spring, G. Smith 244,328
Vehicle wheel, R. M. Tichenor 244,509
Veneer cutting machine, F. L. Wilson 244,154
Veneering machine, G. S. Graf 244,048
Ventilating and fire extinguishing apparatus, C. Raub 244,305
Wagon brake, D. Grubb 244,229
Wagon, brewer's, C. A. Maus 244,067
Wagon spring, A. Barnes 244,109
Wagon, steam, A. H. Elfers 244,117
Warming pan, J. H. Eagan 244,116
Washing and beating yarn, machine for, P. Dorgeval 244,201
Washing and drying machine, centrifugal, J. H. Biggs 244,029
Washing machine, R. G. Baldwin 244,026
Washing machine, L. F. De Voe 244,198
Water closet and bidet bowl, J. Flanagan 244,219
Water cooler, H. P. Stichter 244,086
Water power, Fountain & McDonald 244,221
Watch cases, mould for center rims and bezels of, L. Doriot *et al* 244,202
Watches, jeweling of, C. H. Bagley 244,356
Well tube, drive, W. C. Allison 244,023
Well tubes, check for oil, C. M. Farrar 244,042
Wells, sand and gas shield for oil, T. L. Crowley 244,037
Wheel. See Paddle wheel. Traction wheel.
Wheelbarrow, A. D. Peck 244,288
Whip socket, C. Christian 244,183
Whistle, automatic steam and air, J. H. Crosby 244,036
Window cleaning chair, A. Dormitzer 244,203
Wire lattice, B Klicken 244,063
Wood preserving composition, B. Smith 244,327
Wringer. See Clothes wringer.

DESIGNS.

Button and ornament therefor, J. P. Baker 12,359
Carpet, A. McCallum 12,358
Chinaware, set of, Barlow & Moses 12,350
Cloth, ornamenting, J. E. Carey 12,351, 12,352
Medal or medallion, R. Armistead 12,360
Oil cloth, enameled and table, G. H. Hughes 12,355, 12,356
Shawl, J. D. Craig 12,353
Toy safe, Kyser & Rex 12,357
Window shade, J. C. Hamm 12,354

TRADE MARKS.

Annotto, L. E. Ransom 8,469
Beer, lager, Beck & Co. 8,450
Bolting cloths, S. Carey 8,441
Bread preparations, Rumford Chemical Works 8,453
Brushes, G. A. Scott 8,448
Cigars, plug and fine-cut chewing tobacco, and snuff, W. Duke, Sons & Co 8,444
Dentifrice, T. Egersdorff 8,445
Fertilizing compounds, Atlantic and Virginia Fertilizing Company 8,454
Hermetically sealed goods, certain, Crosse & Blackwell 8,457
Jeweler's tools and files, F. W. Gesswein 8,446
Jewelry, certain articles of, Howard & Scherrieble 8,460
Jewelry, certain articles of, F. G. Whitney & Co 8,452
Leather, Kiefer, Stifel & Co 8,447
Liquor, certain spirituous, N. Van Beil 8,468
Paper of all kinds, writing, Z. Crane, Jr., & Bro 8,455
Pencils, lead, E. Faber 8,458
Pickles, mixed, Crosse & Blackwell 8,456
Preserved fruits and vegetables, Farmer's Fruit Preserving Company 8,459
Soap, laundry, Lautz Bros. & Co ..... 8,461 to 8,466
Stoves, cooking and heating, Comstock, Castle & Co. 8,449
Tobacco, plug, chewing, H. H. Cochran 8,442, 8,443
Whisky, E. H. Taylor, Jr., Company 8,467
Whisky, bourbon, W. H. Livingston 8,451

English Patents Issued to Americans.

From July 5 to July 8, 1881, inclusive.

Binding attachment for harvesting machines, H. B. Blakemore, Cincinnati, O.
Car axle lubricator, C. G. Till *et al.*, Brooklyn, N. Y.
Cleaning machinery for fibrous materials, C. A. Dresser, Southbridge, Mass.
Electro-magnetic motor, M. G. Farmer, Newport, R. I.
Eyeglass, F. Ferstegen, Elizabeth, N. J.
Fire extinguisher, F. Grinnell, Providence, R. I.
Food, preservation of, F. Pool, Charleston, W. Va.
Fruit preserving apparatus, G. A. Cochrane, New York.
Furnace, metallurgic, W. Moller, New York.
Glove fastener, H. M. Peyser, Boston, Mass.
Grain binding machine, M. A. Keller, Brockport, N. Y.
Ice machine, T. Rose, San Antonio, Texas.
Loom, F. O. Tucker, Hartford, Conn.
Magneto-electric machine, T. A. Edison, Menlo Park, N. J.
Metals, manufacture of articles from hollow, A. S. Murphy, Philadelphia, Pa.
Middlings purifier, K. Smith, St. Paul, Minn.
Nail machinery, D. J. Farmer, Penn Yann, N. Y.
Paving block, A. H. Elliott, New York.
Railway vehicle, Wm. Robinson, Boston, Mass.
Shoe burnishing apparatus, W. F. Hutchinson, Lynn, Mass.
Sulphate of alumina, manufacture of, C. Semper, Philadelphia, Pa.
Telephone, G. S. Anders, Boston, Mass.
Wagon, railway dumping, M. Van Woomer, Dayton, O.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)
Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

GREAT LABOR SAVING TOOL.

Chase's Improved Pipe Cutting and Threading Machine is the very best made for cutting off and threading Steam and Gas Pipes, Boiler Tubes, Round Iron, Bolts, Nuts, and making Nipples, from ¼ to 2 inches. No pipe splitting. No bevel inside or outside. No other has *automatic* cut-off. A boy, with this machine, can do more work than two men with old system. Send for circular.
CHASE MACHINE CO., 129 Front St., New York.

McKEAN, NEWHALL & BORIE,
Philadelphia (Lovering) Sugar Refinery,
225 CHURCH ST., PHILADELPHIA,
desire to engage a Superintending Chemist, of the best ability, to whom a liberal engagement would be offered.

VARIABLE CUT OFF ENGINE. 25 TO 50 % SAVED IN FUEL. SIMPLE IN DEVICE ECONOMICAL DURABLE MANF'GTD BY BALL ENGINE CO. ERIE PA.

Cooper on the Use of Belting for the Transmission of Power. With plain, particular, and practical directions for the treatment, care, and management of belts. Demy octavo, cloth, $3.50.
E. CLAXTON & CO., 930 Market St., Philadelphia, Pa.

ASPHALTUM.—A COMPREHENSIVE paper, treating of its geological origin, mode of preparation for industrial purposes, and most important applications. Bitumen, Chemical Composition, and Physical Properties. Geographical distribution. Geological origin. Formation of Asphaltum. Bituminous mastic. Uses and applications of Crude Asphaltum. Mode of preparation for sidewalks and pavements. Applications of Bituminous Mastic or Cement. Asphalt as a preservative against fires. Illustrated with engravings, showing the probable formation of asphaltum in soft limestone strata; the construction of pavements from crude asphalt at Paris, and the mode of making sidewalks. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 276. Price 10 cents. To be had at this office and from all newsdealers.

New and Valuable Oiler for Loose Pulleys.
Its use on Loose Pulleys, especially those running at a high speed, will prove it to be efficient, keeping the pulley oiled from three to four weeks with one filling. Lets no oil on the belt. Guaranteed to *give satisfaction.* Send for catalogue of engineers' and machinists' specialties. VAN DUZEN & TIFT, Cincinnati, O.

Pattern Making.—For good and quick work apply at 14 Library Ct., near Market St., Newark, N. J. R. Mudd.

HAND BOOK FOR STEAM ENGINEERS.
Indorsed: Knowles Steam Pump Works, Crane Bros. M'f'g Co., and others. Price only $1.00. Address
J. H. KERRICK & CO., Publishers, Indianapolis, Ind.

SULPHATE OF SODA.—BY JAMES MACtear, F.C.S. A history of the former methods of manufacturing sulphate of soda or "salt cake," and the inconveniences connected therewith, followed by a detailed description of the author's new mechanical furnace, and of his new continuous system of manufacturing this important chemical product. By the use of the Mactear system thirty per cent. is saved in the manufacturing costs; the operation is continuous, and yields a much more uniform product; the space occupied by the plant is greatly reduced, the escape of deleterious acid fumes is suppressed, and rock salt may be worked quite as easily as common salt. A technical paper of great importance to manufacturing chemists. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 277. Price 10 cents. To be had at this office and from all newsdealers. The same number contains an article on a "New Process for Extracting the Iodine contained in Sea-weeds," by Messrs. Laurdt & Collett.

SKINNERS PATENT COMBINATION CHUCK
UNIVERSAL, INDEPENDENT AND ECCENTRIC
ALL PARTS ARE MADE INTERCHANGEABLE
BY SLIDING THE STUD C, THE CHUCK CAN INSTANTLY BE CHANGED FROM UNIVERSAL TO INDEPENDENT & VICE VERSA
UNION MFG. CO. NEW BRITAIN CONN. SOLE MANUFACTURERS
WAREHOUSE 96 CHAMBERS ST. NEW YORK.

PROFITABLE INVESTMENT.
A valuable water power, of sufficient force for any manufacturing purpose, together with a handsome tract of land and several buildings thereon, situate in Atlantic County, New Jersey, with direct communication by water to the ocean, and but five miles distant from the nearest railroad station, is for sale under very favorable conditions. Address A. STEPHANY,
Egg Harbor City, Atlantic County, N. J.

INDUSTRIAL CHEMISTRY—BRIEF REview of the most important changes in the applications of, within the last few years. By J. W. Mallet. Treating of *Materials and Processes Connected with the Construction of Buildings.* 1. Chief building materials for external use, stone and brick. 2. Lime burning, mortar and hydraulic cements. 3. Stucco. 4. Preservation of timber. 5. Glue and other cements of various applications. 6. Pigments for the use of house painters. 7. Vehicles for paints. 8. Varnishes. *Building Appliances.* A. Explosive agents, used in blasting and otherwise. B. Disinfectants. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 277. Price 10 cents. To be had at this office and from all newsdealers.

BATTERIES, WIRES, MAGNETS, INSTRUMENTS, TELEGRAPH AND ELECTRICAL SUPPLIES. CATALOGUE FREE. C. E. JONES & BRO., CINCINNATI, O.

WATER ELEVATOR, OR STEAM JET PUMP.

Has no moving parts. With 40 lb. steam will elevate water or other liquids (hot or cold) 50 ft. Cheapest reliable steam fire pump made. Lets no steam into the hose. Always ready for use. For raising water from wells and streams into tanks for Mills and Factories, Tanneries, Soap Works, Railway Water Stations, Mines, etc., a *two-inch pump, price* $10.50, with 50 lb. steam, elevates 1,500 gals. water 30 ft. per hour; a three-inch pump, price $18.00, elevates 10 ft. 9,000 gals. All pumps guaranteed. Send for catalogue of engineers' and machinists' specialties.
VAN DUZEN & TIFT, Cincinnati, O.

GET THE BEST AND CHEAPEST.
TRADE PERIN MARK.
Silver Finish.
J. A. FAY & CO.
J. A. FAY & CO.,
(Cincinnati, Ohio, U. S. A.)
Exclusive Agents and Importers for the United States, of the
CELEBRATED
PERIN BAND SAW BLADES,
Warranted *superior to all others in quality, finish, uniformity of temper,* and *general durability.* One *Perin Saw* outwears *three* ordinary saws.

SEND TO LONDON, BERRY & ORTON PHILA PA FOR THE BEST BAND SAW BLADE

VENTILATING FAN for PASSENGER ELEVATORS.
Patent for sale. Has been tested, and is in daily operation. Satisfactory testimonials of efficiency. Apply to LUKE DAVIS, care C. F. Hovey & Co., Boston, Mass.

EUROPE.
Realizing Patents. Import of American goods into Europe. Representation on Exhibitions.
F. CAPITANIE, C.E., 178 Boul. Voltaire, Paris (France).

CLARK'S
RUBBER WHEELS.

This Wheel is unrivaled in the world for durability, simplicity, and cheapness, and is being largely inquired for and introduced in both this and foreign countries on account of its immense saving of the wear and tear of floors.
Adapted for Warehouse and Platform Trucks, Scales, Boxes, Baskets, Tables, Heavy Casters, and for all purposes for which Wheels are used.
Send for Circular and Price List.
GEO. P. CLARK,
Windsor Locks, Conn.

JUST PATENTED. FRUIT AND MEAT Preserved, without heat or chemicals in absolute vacuum. Patent for sale. Address
J. C. HODGES, Morristown, Tenn.

A Good Investment.
BEST FOOT LATHES,
Back geared and screw cutting. Small Lathes, Hand Planers for Metal. Also 36 and 48 in. power. Small Gear Cutters, Slide Rests, etc. Just the articles for business. Highly appreciated. Catalogues free.
N. H. BALDWIN,
Laconia, N. H.

DRUNKENNESS And the OPIUM Habit CURED
By LESLIE E. KEELEY, M.D., Surgeon, C. & A. R. R. Dwight, Ill. Books Free.

COILED GEARS WIRE BELT & SASH CORD TO THE P.T.P. CO. 328 7th Ave. N.Y.

JUST PUBLISHED,
PREPARATION AND USE OF CEMENTS AND GLUE.
By John Phin. Sent by mail to any address for twenty-five cents. Send for our catalogue of Practical Books.
INDUSTRIAL PUB. CO., 14 Dey Street, New York

Agents Wanted. Sells rapidly. Particulars *free.* CIGARS 50 S. M. SPENCER, 112 Wash'n St., Boston, Mass.

FOR SALE.
The entire patent right for a new and valuable improvement in Lamp Tops; forming a splendid article for manufacture, on which large profits can be made at a small outlay. Address, for full particulars,
J. J. HENTZ, 114 South Charles St., Baltimore, Md.

OHIO STATE UNIVERSITY. Mechanical Department. The best place in the West to study Mechanical Engineering. Laboratory method. Shop practice. All modern advantages. Tuition free. Expenses very low. Address Prof. S. W. ROBINSON, Columbus, O.

ESTD. JUNE 22 79 The Cheapest Air Pump EVER OFFERED!

Cylinder, 1⅝ x 3 in.; wheels, 10 in.; weight, 25 lb.; 17¾ in. high; 8 to 9 gals. per min.; 50 lb. pressure and over. *Six Dollars only.* Same style, FIVE TIMES AS LARGE, *only Twelve Dollars!* Will be taken back on order for any larger pump in list within 60 days by
H. WEINDEL,
405 N. Fourth St., Philadelphia.

SCIENTIFIC BREEDING.—BY J. D. CAton. An interesting paper, on the scientific breeding of domesticated animals—especially of the horse, pointing out the astonishing improvements which, in recent years, have been successively wrought by intelligent and judicious selection. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 273. Price 10 cents. To be had at this office and from all newsdealers. The same number contains the pedigree and performances of "Don Cossack," with a portrait of the animal.

40 Lovely Floral, Panel, Hand & Bouquet Chromo Cards, with name 10c. Franklin Prt'g Co., New Haven, Ct.

50 BEAUTIFUL ALL NEW DESIGNS of Butterfly, Dragon-fly, Robin Redbreast, Pinks, Pansies, Violets, and Moss Rosebud Chromo Cards, name on, 10c. Card Mills, Northford, Ct.

ELEVATED CABLE RAILWAYS.—Description and illustration of an elevated cable railway, affording an easy and economical method of transporting coal, coke, ores, etc., to any distance regardless of the nature of the surface of the country. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 270 and 274. Price 10 cents each. To be had at this office and from all newsdealers.

CARY & MOEN STEEL WIRE OF EVERY DESCRIPTION & STEEL SPRINGS. 234 W. 29. ST. NEW YORK CITY

TRANSPARENT CARDS. Make no mistake They are the finest you ever saw! Each card contains a unique scene, 23 with name on, 10 cts. Address HUB CARD CO., Boston, Mass.

To Electro-Platers.
BATTERIES, CHEMICALS, AND MATERials, in sets or single, with Books of Instruction for Gold, Silver, or Nickel Plating. THOMAS HALL, Manufacturing Electrician, 19 Bromfield Street, Boston, Mass. Illustrated Catalogue sent free.

Founded by Mathew Carey, 1785.

BAIRD'S BOOKS FOR PRACTICAL MEN.

Our new and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS, 96 pages, 8vo; a Catalogue of Books on DYEING, CALICO PRINTING, WEAVING, COTTON and WOOLEN MANUFACTURE, 4to; Catalogue of a choice collection of PRACTICAL, SCIENTIFIC, and ECONOMIC BOOKS, 4to; List of Books on STEAM AND THE STEAM ENGINE, MECHANICS, MACHINERY, and ENGINEERING, 4to; List of Books on MINING, MINING MACHINERY, COAL, etc., 4to; Catalogue of Books and Pamphlets on SOCIAL SCIENCE and POLITICAL ECONOMY; a Catalogue of recent additions to our stock of PRACTICAL, SCIENTIFIC AND TECHNICAL BOOKS; as well as a List of LEADING BOOKS on METAL MINING, METALLURGY, MINERALOGY, ASSAYING, AND CHEMICAL ANALYSIS, sent free to any address in the world.

SPECIAL NOTICE.—*Every Reader of the* SCIENTIFIC AMERICAN, *no matter in what part of the world, is specially invited to apply to us by mail for these Catalogues, which will be sent free of postage.*

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

TIGHT & SLACK BARREL MACHINERY
A SPECIALTY
JOHN GREENWOOD & CO.
ROCHESTER N.Y.

GREAT IMPROVEMENTS
RECENTLY MADE IN
CRUSHING AND GRINDING
GOLD AND SILVER ORES, BONES, PHOSPHATE ROCK, & CHEMICALS.
We compel Quartz to grind Quartz.
Address for new circular
BAUGH & SONS, Philadelphia.

The Phosphor-Bronze Smelting Co. Limited.

TRADE MARK

Phosphor-Bronze.

New Offices and Salesroom,
512 Arch Street,
PHILADELPHIA PA.

PHOSPHOR-BRONZE
Wire, Rods, Sheets, Bolts, etc.
Pamphlets and Particulars on Application.

OWNERS OF THE U. S. PHOSPHOR-BRONZE PATENTS.
Sole Manufacturers of Phosphor-Bronze in the U. S.

THE BAKER BLOWER.
[FORCED BLAST.]

The revolving parts are all accurately Balanced.
Warranted Superior to any other.
WILBRAHAM BROS,
No. 2318 Frankford Avenue
PHILADELPHIA, PA.
SEND FOR OUR CATALOGUE.

$55.66 Agents' profit per week. Will prove it or forfeit $500.00. Outfit and Samples worth $5.00 free. Address E. G. RIDEOUT & CO., 10 Barclay Street, New York.

C. J. GODFREY & SON,
UNION CITY, CONN.,
Manufacturers of Metallic Shells, Ferrules, Cups, Blanks, and any and all kinds of small press and stamped work in Copper, Brass, Zinc, Iron, or Tin. Drawn Brass and Steel Ferrules for File, Chisel, and other Tool Handles, also Pocket Match Safes of various styles, are specialties. All kinds of notions, small wares, or novelties in the above line made to order. Work finished plain or nickel plated as desired. Correspondence solicited and estimates furnished.

COE BRASS MFG. CO
TORRINGTON, — CONN.
BRASS AND COPPER IN SHEETS
MATERIALS FOR METALLIC AMMUNITION A SPECIALTY
WIRE AND BLANKS

PATENTS.

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.

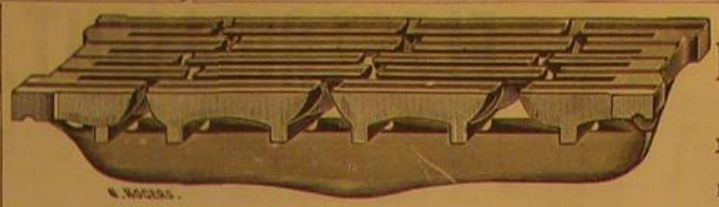
In this line of business they have had *thirty-five years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, 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 reasonable terms.

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

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.

MUNN & CO., Solicitors of Patents,
37 Park Row, New York.

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



W. C. WREN'S
Pat. Grate Bar,
Manufactured by
D. S. CRESWELL,
Eagle Iron Foundry,
816 RACE ST.,
PHILADELPHIA, PA.

ROOFING.
For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.

PATENTS SOLD
Partners Secured.
Joint Stock Companies formed. Stock placed for Incorporated Companies. Good investments always on hand. Highest references given. Circulars free. E. L. RICHARDS & CO., Brokers, 733 BROADWAY, New York.

DO YOUR OWN PRINTING
Presses and outfits from $3 to $500
Over 2,000 styles of type. Catalogue and reduced price list free.
H. HOOVER, Phila., Pa.

---

16 & 18 RACE ST. — JAS. MURDOCK, JR. & CO. — CINCINNATI
MACHINISTS' SUPPLIES IN BRASS, COPPER, GERMAN SILVER.
SEND FOR WIRE, ROD, SHEET & TUBE IN THE THREE METALS. PRICE LIST

MACHINERY
of every description. 121 Chambers and 103 Reade Sts., New York. THE GEORGE PLACE MACHINERY AGENCY.

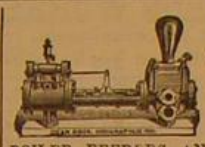
RUPTURE
cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.

ELEVATORS,
Steam and Hand Power. CLEM & MORSE, 411 & 413 Cherry St., Phila., Pa., and 108 Liberty St., New York.

FOR SECOND-HAND ENGINES,
Address HARRIS IRON WORKS, Titusville, Pa.

BIBB'S
Celebrated Original
BALTIMORE FIRE-PLACE HEATERS
To warm upper and lower rooms. The handsomest, most economical Coal Stoves in the world.
B. C. BIBB & SON
Foundry Office and Salesrooms 39 and 41 Light Street,
Baltimore, Md.
MARBLEIZED SLATE MANTELS.
Send for Circulars.

SHAPING MACHINES.
Six in. stroke, with counter shaft and chuck, price $135.
BOYNTON & PLUMMER, Worcester, Mass.



DEAN BROTHERS,
Steam Pump Works,
INDIANAPOLIS, IND.,
Manufacturers of
BOILER FEEDERS AND PUMPING MACHINERY,
FOR ALL PURPOSES.
Send for new Illustrated Catalogue.

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

FIRE BRICK. TILE AND CLAY RETORTS ALL SHAPES.
BORGNER & O'BRIEN.
23 1/2 ST. ABOVE RACE, PHILADELPHIA.

FOUND

THE STEAM PUMPS MADE BY
VALLEY MACHINE CO.,
EASTHAMPTON, MASS.,
Are the best in the world for Boiler Feeding and other purposes.

SNOW'S BEST Water Wheel Governor,
MANUFACTURED BY
COHOES IRON FOUNDRY AND MACHINE CO.,
COHOES, - - N. Y.

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

$72 A WEEK. $12 a day at home easily made. Costly outfit free. Address TRUE & Co., Augusta, Me.

INVALID ROLLING CHAIR.
(RECLINING)

A Priceless boon to those who are unable to walk. Hon. A. H. Stephens, M. C., and hundreds of others use them. Send for Circular to
FOLDING CHAIR CO., New Haven, Conn.

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

SUPERIOR SUBSTITUTE FOR WOOD ENGRAVING.
MOSS ENGRAVING CO.
INCORPORATED 1880. (MOSS'S NEW PROCESS.)
535 PEARL STREET, COR. ELM, NEW YORK.
Engravings of Portraits, Buildings, Landscapes, Machinery, Maps, Etc., for Newspapers, Books, Catalogues, Etc. Much cheaper than Wood Cuts.
THE LARGEST ESTABLISHMENT OF THE KIND IN THE WORLD.

Steam Fitters' & Plumbers' Supplies.
STURTEVANTS' FAN BLOWERS.
ALBERT BRIDGES, 46 Cortlandt Street, New York.

Model Engines.

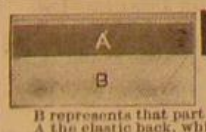
Complete sets of CASTINGS for making small
Model Steam Engines 1 1-2 in. bore, 3 in. stroke, price, $4
ditto 2 in. bore, 4 in. stroke, price, $10, same style as cut;
Gear Wheels and Parts of Models. All kinds of Small Tools and Materials. Catalogue Free. GOODNOW & WIGHTMAN, 176 Washington Street, Boston, Mass.

BEATTY'S ORGANS, 18 useful stops, 5 sets reeds, only $65. Pianos, $125 up. Illus. Catalogue FREE. Address BEATTY, Washington, N. J.

SCHENCK'S WOODWORKING MACHINERY.
Planers and Matchers, Surfacers, Moulders, Tenoners, Engines, Boilers, etc., etc. BELCHER & BAGNALL, 40 Cortland St., New York.

The "SWEETLAND CHUCK." Universal, Independent, and Eccentric. Unexcelled for Accuracy, Strength, Durability, and Simplicity of construction.
SWEETLAND & Co., 126 Union St., New Haven, Conn.

RUBBER BACK SQUARE PACKING.



BEST IN THE WORLD.
For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.
B represents that part of the packing which, when in use, is in contact with the Piston Rod.
A the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.
This Packing is made in lengths of about 20 feet, and of all sizes from ¼ to 2 inches square.
JOHN H. CHEEVER, Treas. NEW YORK BELTING & PACKING CO., 37 & 38 Park Row, New York.

Shafts, Pulleys, Hangers, Etc.
Full assortment in store for immediate delivery.
WM. SELLERS & CO.,
79 Liberty Street, New York.

THE LARGEST
MACHINERY DEPOT IN AMERICA.
STANDARD MACHINERY FOR ALL PURPOSES.
H. B. SMITH MACHINE CO.
ESTAB. 1849. 925 MARKET ST. PHILADELPHIA.

KEUFFEL & ESSER'S, NEW YORK,
Hard Rubber Triangles, Irregular, Railroad and Ship Curves, Scales, Protractors, etc. Warranted to be correct. Send for Catalogues.

Luxuriant Mustache
A. L. SMITH & CO., U. S. Agts., Palatine, Ill.

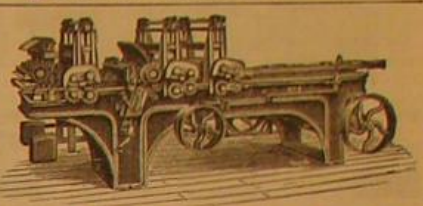
VOLNEY W. MASON & CO.,
FRICTION PULLEYS, CLUTCHES, and ELEVATORS,
PROVIDENCE, R. I.

Prevent Accidents *from slipping.* The handsomest and safest carriage step made. Forged from best iron and formed with a sunken panel, in which is secured a plating of *richly moulded Rubber.* Durability warranted. Illustrated circular free.
RUBBER STEP MANUFACTURING CO., Boston, Mass.

WOODWORKING MACHINERY,
For Railroad Shops, Planing Mills, Car Builders, Cabinet, Carriage, Sash, Door, and Blind Makers.
S. A. WOODS MACHINE CO., 172 High St., Boston; 91 Liberty St., N. Y.; 61 S. Canal St., Chicago.

ROOTS' NEW IRON BLOWER.

POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED
IS SIMPLER, AND HAS
FEWER PARTS THAN ANY OTHER BLOWER.
P. H. & F. M. ROOTS, Manuf'rs,
CONNERSVILLE, IND.
S. S. TOWNSEND, Gen. Agt., 6 Cortlandt St., 8 Dey Street,
WM. COOKE, Selling Agt., 6 Cortlandt Street,
JAS. BEGGS & CO., Selling Agts., 8 Dey Street,
NEW YORK.
SEND FOR PRICED CATALOGUE.



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

"The 1876 Injector."
Simple, Durable, and Reliable. Requires no special valves. Send for illustrated circular.
WM. SELLERS & CO., Phila.

GOLD PENS.

PENCILS, HOLDERS, CASES, &c.
The CALLI-GRAPHIC Pen.
A GOLD PEN and RUBBER HOLDER, containing ink for several days' writing. Can be carried in the pocket. Always ready for use. A luxury for persons who care to preserve their individuality in writing.
MABIE, TODD & BARD,
180 BROADWAY, NEW YORK.
Send for Price-List.
OUR GOODS ARE SOLD BY FIRST-CLASS DEALERS.

SHEPARD'S CELEBRATED
$60 Screw Cutting Foot Lathe.
Foot and Power Lathes, Drill Presses Scrolls, Circular and Band Saws, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, etc. Send for catalogue of outfits for amateurs or artisans.
H. L. SHEPARD & CO.,
331, 333, 335, & 337 West Front Street,
Cincinnati, Ohio.

Steel Castings
From ¼ to 15,000 lb. weight, true to pattern, of unequaled strength, toughness, and durability. 15,000 Crank Shafts and 10,000 Gear Wheels of this steel now running prove its superiority over other Steel Castings. Send for circular and price list.
CHESTER STEEL CASTINGS CO.,
407 Library St., Philadelphia, Pa.

"RELIABLE"
Engines a complete success. Prices still 40 per cent. below those of other makers. Unequaled for efficiency, simplicity, and durability. Prices from $250 for 10 H. P. to $550 for 30 H. P. All complete, with Governor, Pump and Heater.
Address for circular,
HEALD & MORRIS, formerly HEALD, SISCO & Co.,
Baldwinsville, N. Y.

THE Hancock Inspirator,
THE BEST BOILER FEEDER KNOWN.
Over 17,000 in use on Locomotive, Stationary, Marine, and Portable Boilers.
THE HANCOCK INSPIRATOR CO.,
BOSTON, MASS.

NO MORE USE FOR OIL ON MACHINERY
Oline Lubricating Compound, manuf'd by HOLLAND & THOMPSON, Troy, N. Y. Avoids hot journals, dripping, and waste. Send for catalogue of Grease and Cups for all kinds of machinery.

Leffel Water Wheels,
With recent improvements.
Prices Greatly Reduced.
8000 in successful operation.
FINE NEW PAMPHLET FOR 1879.
Sent free to those interested.
James Leffel & Co.,
Springfield, O.
110 Liberty St., N. Y. City.

BELT FRICTION CLUTCH
For Gears, Shaft, Couplings, and Pulleys.
W. OESTERLEIN,
13 Home St., Cincinnati, Ohio.

PATENT COLD ROLLED SHAFTING.
The fact that this shafting has 75 per cent. greater strength, a finer finish, and is truer to gauge, than any other in use renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS' PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLINS,
Try Street, 2d and 3d Avenues, Pittsburg, Pa.
Corner Lake and Canal Sts., Chicago, Ill.
Stocks of this shafting in store and for sale by
FULLER, DANA & FITZ, Boston, Mass.
Geo. Place Machinery Agency, 121 Chambers St., N. Y.

Advertisements.

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

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

Establ'd **EAGLE ANVILS.** 1843.
Solid CAST STEEL Face and Horn. Are Fully Warranted. Retail Price, 10 cts. per lb.

Double Screw, Parallel, Leg Vises.
Made and WARRANTED stronger than any other Vise by FISHER & NORRIS only, Trenton, N. J.

"1880" Lace Cutter. By mail, 50c. Discount to the trade. Sterling Elliott, 252 Dover St., Boston, Mass.

BOILER COVERINGS,

ASBESTOS-LINED, REMOVABLE.
THE PATENT AIR SPACE COVERINGS.
THE CHALMERS-SPENCE CO., Sole Proprietors,
10 Cortland St. Foot of East 9th St., New York.

Gear Cutting. Send for list of Gears. GRANT, 4 Alden St., Boston, Mass.

THE NEW YORK BELTING AND PACKING COMPANY
Largest Belt Ever Made!
½ mile long, 3 feet wide,
IS OF OUR MAKE. EQUALS 500 OX HIDES.
37 & 38 PARK ROW, NEW YORK.

HOLCOMB'S NEW
Amplifying Telephones,
FOR PRIVATE LINES.
The latest and best. Patented April 26, 1881. These new instruments embody recent and important improvements. They transmit conversation, music, orders, etc., with almost electric speed and surprising fidelity. The only durable and reliable substitute for the Electric Telephones Work two miles. Price $10 per set. Illustrated Circulars FREE.
[Mention this paper.] HOLCOMB & CO., Mallet Creek, O.

FOR SALE.—Steam Mill in North part of State. New first-class engine and machinery. Beside railroad. Good location for chair, broom, and fork handle, or other wood manufacture. A bargain for cash.
WM. IRWIN, 152 Broadway, New York.

FOR SALE.—U. S. PATENT OF VALUABLE FLOURING MILL MACHINE. Very popular and profitable. H. C., Box 773, New York.

PORTER MANUFG. CO., Lim. New economizer. Only portable made with return flue. Absolute safety from explosion and from sparks. Send for circs. to Porter Mfg. Co., Lim., Syracuse, N.Y. G. G. Young, Gen. Agt., 42 Courtlandt St., N.Y.

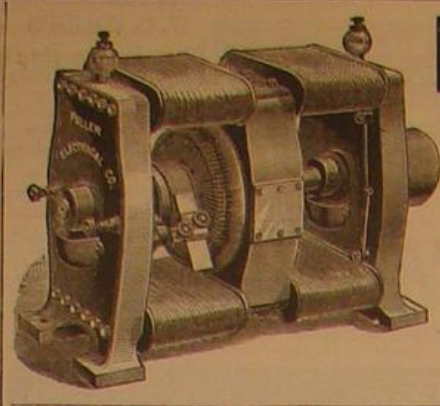
H.W.JOHNS'
ASBESTOS
LIQUID PAINTS,
ASBESTOS ROOFING,
ASBESTOS BOILER COVERINGS,
ASBESTOS LINING FELT,
ASBESTOS STEAM PACKING,
ASBESTOS WICK PACKING,
ASBESTOS FLAT PACKING,
ASBESTOS MILLBOARD,
ASBESTOS GASKETS,
ASBESTOS SHEATHINGS,
COATINGS, CEMENTS, Etc.
Descriptive price lists and samples sent free.
H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.

Jenkins' Patent Packing and Valves.
"THE STANDARD."
Jenkins' Packing has never failed to make a perfect joint where directions were followed. Jenkins' Valves are warranted steam tight and are made of the best steam metal. JENKINS BROS., 71 John St., New York.

Jarvis Furnace Co.
Patent Setting for Steam Boilers Burns Screenings and Slack Coal without Blast. No. 7 Oliver St., Boston; No. 97 Liberty St., New York; No. 709 Market St., St. Louis; No. 1 Second St., Baltimore.

THE COMMON SENSE DRY KILN.

In solving the true principle of seasoning, extracting the sap from the center by suction, rapid circulation of air, with moderate heat, we offer the cheapest kiln in construction, quickest in operation, and perfect in results. Prevents checks, warp, or hardened surface.
ST. ALBANS M'F'G CO., St. Albans, Vt.



ELECTRIC LIGHT.

THE FULLER ELECTRICAL COMPANY, having perfected their system of Electric Lighting, are prepared to furnish the Improved Gramme Dynamo Electric Machines and Electric Lamps, either for single lights or for from 2 to 20 lights in one circuit.

This apparatus is unexcelled for durability, steadiness of light, and economy of power, and requires less attention than any other.

For price list and further particulars, apply to
THE FULLER ELECTRICAL COMPANY,
44 East Fourteenth Street, NEW YORK.

ERICSSON'S
New Caloric Pumping Engine
FOR
DWELLINGS AND COUNTRY SEATS.
Simplest cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.
DELAMATER IRON WORKS
C. H. DELAMATER & CO., Proprietors,
No. 10 Cortlandt Street, New York, N. Y.

COLUMBIA BICYCLE.
The Bicycle has proved itself to be a permanent, practical road vehicle, and the number in daily use is rapidly increasing. Professional and business men, seekers after health or pleasure, all join in bearing witness to its merits. Send 3 cent stamp for catalogue with price list and full information.
THE POPE M'F'G CO.,
597 Washington Street, Boston, Mass.

FRIEDMANN'S PATENT
EJECTORS
Are the cheapest and most effective machines in the market for
Elevating Water and Conveying Liquids
from Mines, Quarries, Ponds, Rivers, Wells, Wheel Pits; for use in R. R. Water Stations, Factories, etc. They are splendidly adapted for conveying liquids in Breweries, Distilleries, Sugar Refineries, Paper Mills, Tanneries, Chemical Works, etc. Send for illus. catalogue to
NATHAN & DREYFUS,
Sole Manufacturers, NEW YORK.

Mill Stones and Corn Mills.
We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys, and Gearing specially adapted to Flour Mills. Send for catalogue.
J. T. NOYE & SONS, Buffalo, N. Y.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

BRADLEY'S CUSHIONED HAMMER
BRADLEY & COMPANY SYRACUSE, N.Y.

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

$66 a week in your own town. Terms and $5 outfit free. Address H. HALLETT & Co., Portland, Me.

SASH DOVETAILING MACHINE.

Planers, Moulding Machines, Mortisers and Borers, Tenoning Machines, Blind Rabbeting Machines; also, a large variety of other wood working machines manufactured by
LEVI HOUSTON, Montgomery, Pa.

THE CAMERON STEAM PUMP,
DESIGNED FOR USE IN
GOLD, SILVER, COAL, AND IRON MINES,
ALSO FOR GENERAL MANUFACTURING AND
FIRE PUMPS.
Pumps furnished with Movable Linings in Iron, Composition, or Phosphor-Bronze.
Address THE A. S. CAMERON STEAM PUMP WORKS,
FOOT EAST 23d STREET, NEW YORK CITY.

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

WATCHMAN'S IMproved Time Detector, with Safety Lock Attachment. Patented 1875-6-7. Beware of Infringements. This Instrument is supplied with 12 keys for 12 different stations. Invaluable for all concerns employing night watchmen. Send for circulars to E. IMHAUSER, P. O. Box 2875. 212 Broadway, New York.

MICROSCOPES *Opera Glasses, Spectacles, Telescopes, Barometers, Thermometers,* and *Compasses.* R. & J. BECK, Manufacturing Opticians, Philadelphia, Pa. Send for Illustrated Priced Catalogue.

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

PATENT
Steam Hoisting Machines
Four Sizes—4 to 10 Horse Power. The Four Horse Power will raise 1,320 lb. 150 feet per minute. Other sizes in proportion.
NOBLE & HALL,
ERIE, PA.

THE BERRYMAN PATENT
Feed Water Heater and Purifier
Have been in use ten years, and never require repairs.
I. B. DAVIS & SON, Hartford, Conn.,
Sole Proprietors and Manufacturers in the U. S.

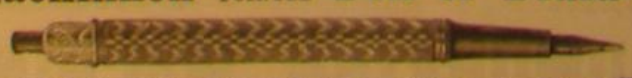
FOR INFORMATION CONCERNING
Holly Water Works,
FOR
CITIES, VILLAGES, SUBURBAN TOWNS, FACTORIES, ETC.,
Apply to the
HOLLY MFG. CO., LOCKPORT, N.Y.
Or C. G. HILDRETH, Sec'y,
157 Broadway, New York City.

DROP HAMMERS.
STILES & PARKER PRESS CO., Middletown, Ct.

SHAFTS PULLEYS HANGERS
At Low Prices. Large Assorted Stock.
A. & F. BROWN, 57-61 Lewis St., New York.

ICE AT $1.00 PER TON.
PICTET ARTIFICIAL ICE CO., Limited,
P. O. Box 3083. 142 Greenwich St., New York.
Guaranteed to be the most efficient and economical of all existing Ice and Cold Air Machines.

HOLDS INK FOR A WEEK'S USE. ANY GOOD INK MAY BE USED.
The Mackinnon IRIDIUM POINTED Pen or Fluid Pencil.



THE ONLY RESERVOIR PEN IN THE WORLD WITH A CIRCLE OF IRIDIUM AROUND THE POINT.
Always ready. Always with you. Cannot Blot. Cannot be worn out in a lifetime.
MACKINNON PEN CO., 192 BROADWAY, CORNER JOHN STREET, NEW YORK.
General Supply Depots in all principal cities in America and Europe.

THE
New York Ice Machine Company,
115 Broadway, New York, Room 78.
LOW PRESSURE BINARY ABSORPTION SYSTEM.
Machines Making
ICE AND COLD AIR.
Low Pressure when running. No pressure at rest. Machines guaranteed by C. H. Delamater & Co.

TO INVENTORS
THE
Howard Manufacturing Co.
(INCORPORATED,)
364 & 366 Broadway, New York.
Organized for the manufacture and introduction of
PATENTED NOVELTIES
AND
YANKEE NOTIONS,
OF EVERY DESCRIPTION.
AMPLE CAPITAL.
Latest Improved Machinery.
CONNECTIONS WITH ALL WHOLESALE MERCHANTS IN THE UNITED STATES AND CANADA.
Agents in Foreign Countries.
Correspondence without charge, with all who desire their inventions *in our line* developed.

PROSPECTUS
OF THE
Scientific American
FOR 1881.

The Most Popular Scientific Paper in the World.

VOLUME XLV. NEW SERIES.
COMMENCES JULY 1.

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.

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

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

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

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, 1 year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for 1 year. This includes postage, which we pay. Remit by postal order or draft to order of Munn & Co., 37 Park Row, New York.

PRINTING INKS.
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

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

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

Vol. XLV.—No. 8. [NEW SERIES.] NEW YORK, AUGUST 20, 1881. [$3.20 per Annum. [POSTAGE PREPAID.]

THE MANUFACTURE OF SEWING MACHINES.—FACTORY OF THE DAVIS SEWING MACHINE CO.

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.

Remit by postal order. Address

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

The Scientific American Supplement

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

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

The safest way to remit is by draft postal order, or registered letter.

Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

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

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

NEW YORK, SATURDAY, AUGUST 20, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

Alcohol, Dr. Andrew Clark on... 120
American industries*... 117
Anthracite, another trial of the... 113
Asphalt... 121
Butter coloring... 112
Castor oil, gas from... 117
Coffee and sugar... 120
Comets, tails of... 112
Day's work, good, on a railroad... 118
Deep sea soundings... 119
Development, retarded, case of... 116
Deville, Sainte Claire, Professor... 115
Dragon flies, swarms of... 113
Dynamometer, optical*... 114
Earth stars*... 119
Electro magnet, a large... 123
Engineering inventions... 114
Explosion, dust, Ehret's brew'y*... 113
Explosion, strange, a... 113
Faure battery, the... 118
Fences, iron, improvement in*... 118
Floors, sunken... 121
Gas from castor oil... 117
Grasshoppers in Turkey... 119
Hectograph, improved... 116
Horse, supposed new species of... 119
Industries, American... 117
Inventions, engineering... 114
Inventions, miscellaneous... 118
Inventions, new... 114
Inventions, recent... 117
Iron fences, improvement in*... 118
Kerosene, non-explosive... 112
Lamp, safety, a new... 119
Locomotive, naphtha, a... 116
Meteor, Minnesota, a... 116
Meteorological station, portable*... 115
Natural history notes... 120
Oil of bitter almonds... 120
Optical dynamometer*... 114
Pants, attachment for*... 116
Paper trade, improvement in the... 115
Patent decisions... 122
Pulque... 120
Rail fastening, new*... 115
Railway progress in 1880... 121
Roberts, W. Milnor... 115
Sewing mach. works, Davis*... 111, 117
Spiders obstruct the telegraph... 116
State taxation of pat'd articles... 112
Steam boiler notes... 115
Steamer, mountain, a... 122
Steamer, western, new, elegant... 114
Tool, handy, a*... 118
Tool, new, a*... 118
Turtle, a three hundred dollar*... 119
Volcanic soils, fertility of... 121

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 294,

For the Week ending August 20, 1881.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—Vavasseur's Naval Gun and Carriage. 4 figures.—Improved naval gun carriage and brake, with details... 4679
The Nordenfeldt Mitrailleuse and Ammunition.—Perspective—A. Marine type.—B. Campaign type.—9 large figures (to scale).—Elevation.—Plan.—Plans of locks and plungers.—Under side of lock and trigger plate.—Sections showing gun cocked and gun discharged.—Section showing the lever movement of the carriers.—Longitudinal section of the chamber of gun.—Transverse section of barrel.—Section of cartridge... 4680
Lundborg's High Speed Steamships. 6 figures.—Plan, elevations, sections, etc., of a novel type of passenger steamers.—Description and calculations... 4683
High Speed Steamships.—Statement of the advantages of Lundborg's system by the inventor... 4684
A Water Velocipede. 1 figure.—Water velocipede used by the Prince of Wales on Virginia Water, Windsor Park... 4684
A New Life Buoy. 3 figures.—The buoy.—Buoy with man inside.—Hoisting on board... 4685
Annular Wheels.—A note from Prof. MacCord... 4685
Prevention of Smoke... 4685
Master Car Builders' Standard Car and Tender.—Axle scale drawing with measurements... 4685
The Water Mark in Paper... 4685
The Prevention of Stoppages in Ascension Pipes in Gas Making. 4687

II. PHYSICS, ELECTRICITY, ETC.—On the Distribution of Electric Currents. By M. BAILLOUIN... 4687
Electric Behavior of Flame. By W. HOLTZ... 4687
Physical Studies of Lake Tahoe. By Prof. JOHN LE CONTE.—Relation of temperature to depth.—Why the water does not freeze in winter.—Why bodies of the drowned do not rise.—Transparency of the water.—Prof. Forel's investigations of the waters of the Lake of Geneva.—The cause of the transparency of the waters of Silver Spring, Florida.—Color of the water of Lake Tahoe.—Physical cause of the color of the waters of certain lakes and seas.—Colors of transparent liquids.—Color of pure water... 4687
The Strophometer. 1 figure... 4690
Radio-Dynamics. By PLINY EARL CHASE. Electric relations of light.—Electro-magnetism a radial phenomenon.—Reasons.—Weighing the sun with soap bubbles... 4690
Photometrical Researches. Mons. A. CORNU's novel photometrical and spectro-photometrical appliances, and their results. 1 fig. 4691

III. HYGIENE AND MEDICINE.—Diseases of the Ear. Four cases of Otomycosis aspergillina successfully treated by the insufflation of oxide of zinc and boracic acid. By Dr. SAML. THEOBALD... 4692
A Case of a Bottle in the Rectum. Its successful removal. By Dr. L. A. RODENSTEIN. Summary of noted cases of foreign bodies in the rectum... 4693
On Filth and Semi-Filth Diseases. By Dr. J. C. PETERS... 4693
Chronic Tobacco Inebriety. By Dr. A. B. ARNOLD. Results obtained by poisoning animals with nicotine.—Effects of large doses of tobacco.—Physical disturbances caused by excess in the use of tobacco... 4693

IV. ART, ARCHITECTURE, ETC.—Suggestions in Decorative Art. Border ornaments, marble mosaic pavement.—Siena Cathedral, 14th to 16th century. 14 figures... 4686
Suggestions in Architecture. An English tavern. Perspective and plans... 4687
Coffee Tavern and Hostelry, Newark-on-Trent, England... 4687

V. NATURAL HISTORY.—The Cat and its Relations. (Continued from No. 293). By FREDK. A. LUCAS. Proboscidians.—Hyraxes.—Hoofed animals.—Carnivores.—The cat a carnivorous mammal.... 4694

NON-EXPLOSIVE KEROSENE.

Very frequently of late we have received from correspondents, East and West, samples of "stuff" sold them by peddlers with the assurance that when a little of these preparations are mixed with the poorest burning oil the latter is rendered *perfectly safe*. Of course one of the chief inducements to use these compositions is the assurance that with them a much cheaper oil of equal illuminating power can be used safely.

This fraud is a very dangerous one, and perhaps the best way to stop it is by the diffusion of a little practical information respecting these oils.

In the first place, there is nothing that can be added to or mixed with poor kerosene oil that will in the least affect its dangerous qualities or make it any safer to use in lamps. The danger with such oils arises solely from the presence in them of light, easily volatilized, and very inflammable hydrocarbons, such as naphtha, the vapor of which, when mixed with air, explodes on contact with flame.

Kerosene and naphtha or benzine are derived by a process of distillation from the same substance—petroleum. The lighter oils—gasoline, naphtha, benzine, etc.—are first volatilized and condensed. As the products distill over they are tested from time to time with a hydrometer, and when it is found that the stream of distilled oil marks about 58° (Baume's hydrometer), what follows is turned into another tank until it is found that the gravity of the oil coming over has risen to about 40°, then the stream is deflected into another tank. The oil distilled between 58° and 38° is called kerosene or burning oil.

In this process about 15 per cent of the light oils are produced, and as there is comparatively little demand for them they are very cheap. Naphtha costs from 2 to 5 cents a gallon, while good kerosene costs from 20 to 25 cents. As great competition exists among the refiners there is a strong inducement to turn the heavier portions of the naphtha into the kerosene tank, so as to get for it the price of kerosene or to cheapen the latter. They change the direction of the stream from the still when it reaches 65° to 63° B., instead of waiting until it reaches 58°; and thus the volatile inflammable naphtha or benzine is allowed to run into the kerosene, rendering the whole of the latter dangerous. It has been shown that one per cent of naphtha will lower the flashing point of kerosene ten degrees, while with twenty per cent of naphtha the same oil will flash at eight degrees (Fah.) above the freezing point of water. It is, therefore, the cupidity of the refiner that leads him to run as much benzine as possible into the kerosene regardless of the consequences.

The specific gravity is not a safe guide respecting the character of such oils, as a poor dangerous oil may be heavier than a safe oil. Astral oil illustrates this. While it does not flash below 125° Fah., its gravity is 49° B. Poor kerosene flashes at 86° Fah., but has a gravity of 47° B.

Kerosene when properly refined is nearly colorless by transmitted light and slightly fluorescent by reflected light. Its density should be about 43° B. At ordinary temperatures it should extinguish a match as readily as water without becoming inflamed or *flashing*, and when heated it should not evolve an inflammable vapor below 110° Fah., and should not take fire below 125° to 140° Fah.

As the temperature in a burning lamp rarely exceeds 100° Fah., such an oil would be safe. It would produce no vapors to mix with the air in the lamp and make an explosive mixture, and if the lamp were overturned or broken the oil would not take fire.

The standard which has generally been adopted by law as a safe one fixes the flashing point at 100° Fah., or higher.

Professor Chandler, President of the New York City Board of Health, says: "Out of 736 samples of kerosene oil tested by me, only 28 were really safe, all the rest evolving inflammable vapor below 100° Fah." In his paper on the temperature of oil in lamps (*American Chemist*, August, 1872, p. 43) Dr. Chandler has shown that in some cases the temperature of their contents often rises above 100° Fah.

STATE TAXATION OF PATENTED ARTICLES.

We publish, in another column, an interesting decision by the Supreme Court of the United States, in which the question of the right of a State to enforce its local tax or license laws as against the sale of patented articles is once more considered and adjudicated. The defendant having refused to pay a county tax in Henrico County, Va., was indicted and found guilty. One of the points in the defense was that the sales related to patented articles, and that no State had a right to hinder such sales by taxation.

On appeal, the United States Supreme Court decides, in this case (and it has so held in other cases), that venders of patented goods must, like other people, conform to the State laws. The patent laws, it is true, confer on patentees the exclusive right to sell their inventions and discoveries, but this does not apply to tangible property or goods. The patentee may sell rights, licenses, and privileges of all kinds under his patent, and no State has the right to interpose any law, tax, or penalty to hinder or prevent such selling. This patented right relates to the invention or discovery, and is an incorporeal right which the State cannot interfere with. But whatever rights are secured to inventors must be enjoyed in subordination to the general authority of the State over all property within its limits. Hence the State may tax all sales of goods, whether they are patented or not. No tax, however, can be imposed upon a patent, or on any sales relating to rights thereunder.

The Supreme Court also held, in the case above referred to, that all State laws that discriminate in favor of citizens resident in such State, and against citizens of other States, are invalid. The State of Virginia cannot exempt its own citizens from license taxes, and impose them upon citizens of New York when they visit Virginia. To do so would be to regulate commerce, which, under the Constitution, is a national, not a State, right.

BUTTER COLORING.

It is a fact not generally known that much—it might be said nearly all—of the butter offered for sale in our large cities owes its "rich golden color" to artificial additions. The dairyman, as well as the butter dealer, has found that butter of a *good color* commands a readier sale than pale butter, and as a color is so easily and cheaply procured the temptation to improve (or, at least, to equalize) the natural tint of the commodity is not to be resisted. As long as the coloring matters used are harmless there can be no valid objection urged against the practice, and we have no reason to believe that anything really pernicious has thus been introduced into our food—at least of late years.

The coloring matters commonly employed are annatto and turmeric, or extracts of these; but there are also a number of butter-coloring compounds or mixtures sold for this purpose. For some of these it is claimed that they will not only impart the desired color to butter, but will keep it sweet and *fresh* for an indefinite time. The following are a few of these coloring compounds in use at present. Rorick's compound is prepared as follows:

The materials for 1,000 pounds of butter are:

Lard, butter, or olive oil	6	pounds.
Annatto	6	ounces.
Turmeric	1	ounce.
Salt	10	ounces.
Niter	½	ounce.
Bromochloralum	3½	ounces.
Water	q. s.	

The lard, butter, or oil is put into a pan and heated in a water bath. The annatto and turmeric are then stirred into a thin paste with water, and this is gradually added to the fatty or oily matters kept at a temperature of about 110° Fah. The salt and niter are next stirred in, and the mixture heated to boiling. The heating is continued for from twelve to twenty-four hours, or until the color of the mixture becomes dark enough. The bromochloralum is then introduced and the mass is agitated until cold, when it is put up in sealed cans.

Bogart's preparation is prepared as follows:

The materials employed are:

Annattoine	5	ounces.
Turmeric (pulverized)	6	"
Saffron	1	ounce.
Lard oil	1	pint.
Butter	5	pounds.

The butter is first melted in a pan over the water bath and strained through a fine linen cloth. The saffron is made into a half pint tincture, and, together with the turmeric and annattoine, is gradually stirred into the hot butter and oil and boiled and stirred for about fifteen minutes. It is then strained through a cloth as before and stirred until cool.

Dake's butter coloring is prepared by heating a quantity of fresh butter for some time with annatto, by which means the coloring matter of the butter is extracted, and straining the colored oil and stirring it until cold.

THE TAILS OF COMETS.

Camille Flammarion, in a paper read before the French Academy of Sciences, on the recent comet, says:

In my observations on this comet I have devoted myself principally to an examination of its physical aspect. This examination appears to lead to conclusions which are different from the opinions generally adopted as to the nature of cometary tails. . . . The perfect transparency of these trains of light leads us to think that they are *not material*, that they are not gases driven back into space by a repulsive solar force, but that they are an excitation—electric or otherwise—of ether produced by the mysterious star, on the side opposite from the sun, we might almost say in the line of its shadow!

On the 24th of December, 1811, Piazzi observed at Palermo, through the tail of the celebrated comet of that year, the stars P. XX., 149, and P. XX., 197, which, instead of being more or less obscured, were seen to be *more luminous*. . . . Apropos of these unexplained physical phenomena, let us dwell for a moment on the assuredly extraordinary circumstance which occurred last year, and which was only the renewal of one of the same kind observed already in 1843. On the 28th of January, 1880, at 36 minutes past 11 o'clock in the morning, the great comet discovered in the Southern hemisphere passed to its perhelion at 150,000 miles only from the solar surface. In adopting the figure 90,000 miles as the diameter of the head—the figure generally adopted also for the comet of 1843 (which, moreover, appears to be definitely the same as that of 1880), we see that from surface to surface there was only 108,000 miles. The proximity was more surprising still on the 27th of February, 1843. The two celestial bodies brushed each other at 33,000 miles only—that is to say, the comet traversed the solar atmosphere at a height less than that of the corona, and even of that of the protuberances, several of which have been ascertained to measure 200,000 miles in height. Now at these two epochs the comet was accompanied by a narrow and rectilinear train, which it car-

ried with it always on the side away from the sun, and which stretched out 125, 150, and even 200 millions of miles in length. To make in two hours a half revolution of the sun, it rushed along with a velocity of 167,700 feet per second (perhelion of 1843)—a velocity of the elliptical order, considering the fearful attraction of the sun, but which would have become rapidly parabolic at a little greater distance. Now at the distance of the earth, at 95 millions of miles, the rectilinear and rigid tail must have swept space with a velocity of over 19,500,000 feet per second!

Does not this circumstance, which has presented itself to our eyes twice in thirty-seven years, taken in connection with the perfect transparency of these trains of light, lead to the consequence that *the tails of comets cannot be material?* Is it an electrical illumination of the ether? Is it an undulatory motion excited by the comet itself on the side opposite from the sun? We do not as yet know all the forces of Nature.

A STRANGE EXPLOSION.

To the Editor of the Scientific American:

I was recently called upon by Professor S. P. Langley, Director of the Alleghany Observatory, to silver three heliostat mirrors for him that he intended to use in his present expedition to the Sierra Nevada Mountains. These mirrors he wanted with a surface as perfect as could be made, and they were to be so bright from the bath as to need absolutely no retouches with a polishing pad, as the microscopic scratches produced by the pad would be detrimental to his experiment. The silvering was a success; a beautiful and fine reflecting surface being obtained from the bath.

In making one of the solutions, I had put 240 grains nitrate silver in 2 oz. distilled water, and 240 grains absolutely pure potassa in the same amount of water; each in separate vessels. I now poured them together, with the usual result. The silver was precipitated in the form of a grayish brown oxide. I then poured in aqua ammonia to redissolve the silver, but for some cause unknown to me, after pouring in fully seven ounces of ammonia, three times the usual amount, the precipitate would not dissolve, and I gave it up for a bad job, as an excess of ammonia always causes a thin deposit of silver. I poured the solution into a pint jelly glass and set it on top of my writing desk with simply a bit of paper over it to keep the dust out.

Three days afterward, at about two o'clock in the afternoon, I sat down at the desk to answer a letter, but before I finished it I was called out of my shop, and I think I was not away three minutes when a fearful explosion was heard in the shop. I hurried in, as also did the neighbors, and I found my shop literally strewn with glass fragments of silvering dishes, bottles, graduates, and funnels, and the sides of the shop floor and roof splattered all over with particles of glass as fine as dust. Every place the solution had touched was turning brown. The crash was heard for a great distance, and the wreck was complete. The force of the explosion caused the bottom of the glass to embed itself fully a quarter of an inch deep into the hard cherry wood, showing that it must have been very powerful, the glass itself being blown into atoms. The thermometer marked 96 in the shade about the time of the explosion. Now I would like some of your chemical readers to explain this, if it is explainable. Did the fulminate of silver form in any way? The vessel being open a gas could not have done such destructive work. It was fortunate for me that I was called out when I was, or I should likely have lost a pair of valuable eyes. Of course I shall leave no such solution stand even uncovered hereafter. Nevertheless I should like to know what caused the explosion.

I. A. BRASHEAR.

Pittsburg, Pa., July 23, 1881.

[REMARKS.—The explosive in Mr. Brashear's case was Berthollet's fulminating silver, a very curious and dangerous substance which results from the action of ammonia on oxide of silver. A very good receipt for producing it, is as follows: Digest freshly precipitated oxide of silver in strong liquor of ammonia for twelve or fifteen hours, then pour off the liquid, and cautiously dry the black crystalline powder which remains and which is the fulminate. Also the decanted ammonia contains some fulminate, and this will be deposited on cooling after gentle warming of the liquid or on spontaneous evaporation. Only a very few grains of oxide of silver should be used in a single operation.

Mr. Brashear had in his jelly glass freshly precipitated oxide of silver and ammonia, and the digestion went on, all as the receipt prescribes. There was also in the glass nitrate of potash, which probably was an inactive substance, for it did not prevent the formation of the fulminate. Perhaps there was present for the explosion about as much fulminate as was possible to produce from 240 grains of nitrate of silver.

The Berthollet fulminate is one of the most unmanageable and dangerous of known explosives. One writer says: "This compound is exploded by the slightest friction or percussion, and should therefore be only made in very small quantities at a time and handled with great caution. Its explosive powers are tremendous; in fact it can hardly be handled with safety, even in the moist state. Many frightful accidents have happened from the spontaneous explosion of this substance."

It is a singular fact that this fulminate is mentioned by only a few of the modern treatises on chemistry, and that although it was discovered in the last century very little is known of its chemical relations. The fullest accounts of it are to be found in books which are now obsolete. We quote a few sentences about it from Akin's Dictionary of Chemistry, London, 1807: "Even when still wet if it be pressed upon with a hammer, or any hard body, it fulminates with extreme violence, but when dry, the touch of a slender wire or even a feather, or a heat of about 96° is sufficient to make it explode. Even a moderate concussion of the air is sufficient, so that a heap may be exploded by the concussion of any other in its immediate neighborhood. Sometimes too it will go off in the hand, when carrying from one place to another, so that in fact when it is once dry, the operator should be prepared for the explosion at any time, even with the most careful handling."

Berthollet's fulminate must not be confounded with the ordinary fulminate of silver which is employed in the toy torpedoes, and which is made by heating a mixture of nitrate of silver, alcohol, and nitric acid. The latter, although a terrific explosive, is comparatively safe.—ED.]

DUST EXPLOSION IN EHRET'S BREWERY.

The splendid building owned and occupied by Mr. Geo. Ehret, as a lager beer brewery, located between 92d and 93d streets, and 2d and 3d avenues, N. Y., was injured on the 30th of July, 1881, by an explosion of malt dust, which also set it on fire. It is one of the finest breweries in the country, seven stories high, and ornamented elaborately with insignia of the business and samples of fine bricklaying. Our engraving gives an idea of the magnitude of the structure. The crushed malt from the malt crushing machines in the lower part of the building is carried by an endless belt elevator through a closed box to an upper chamber in the top of the tower, whence the malt is distributed for brewing through spouts to all parts of the building. The fine dust occasioned by the crushing is suspended in

DUST EXPLOSION IN EHRET'S BREWERY.

the air in the chamber, and in this condition it will burn with explosive rapidity when ignited. The distributing chamber of the central system of this establishment was located on the upper floor, formed by a light transverse partition in the room beneath the clock tower, the lower end of the elevator being on the third floor, just below, the crushing rolls which were on the fourth floor. The initial explosion, which was followed by two or three secondary ones, or noises like explosions, and the fire, took place at or near the upper part of the elevator case, bursting out a small area of perhaps its weakest part. The margin of the opening was scorched and splintered, but not set on fire, and the ceiling boards in the vicinity were also scorched as though they had been exposed to a flash of gunpowder.

The fire, however, appears to have originated in the attic above the malt bins in the western wing, which was probably the location of the second, and, perhaps, third explosions, if such really occurred. To persons inside of the building the falling of the bricks into the street and upon the roof of the two-story extension might have been mistaken for explosions of dust. The flat portion of the main roof of the western wing was lifted and took fire, and the iron stairway and ornamental railings were broken and thrown about. The sloping mansard roof at the western end, together with the metal cornice and the upper part of the brick wall, was blown out and fell through the roof of the two-story extension of the western wing into the dry room above the boilers, luckily going no farther in that direction. Near the location of the initial explosion at the center of the north front, the ornamented gable of the transept was blown out and fell into the street, where some very narrow escapes of people from sudden destruction are said to have occurred. The timely appearance of firemen upon the scene and their prompt efforts soon subdued the flames and saved this fine structure, but a large quantity of stored malt was ruined by water.

In regard to the frequency of this class of explosions, the *Times* has the following:

"Mr. Hasslocher, the superintendent, and several of Mr. Ehret's employes, spoke of the occurrence as being far from extraordinary. On the 4th of July, 1880, a common lucifer match among the malt was ignited in the malt mill, in which are two steel grinders, which make about 150 revolutions a minute. The flash of the match set fire to dust in the elevator, and an explosion occurred which did about $2,000 damage. Similar explosions have recently occurred at Huppfel's brewery and at Ruppert's. A pebble or a piece of steel among the malt in the mill could produce a spark which, if it came in contact with the saccharine fine dust in the elevator, would cause either a flash or an explosion according to the quantity of dust in the air. Just as good a flash can be produced with this malt dust as with lycopodium spores, which were once used in theaters to simulate lightning."

The same journal also says of the lecture of Prof. L. W. Peck, which was delivered in May, 1878: "He illustrates the theory that dust mixed with air is not only combustible, but explosive, by saying: 'If a large log of wood were ignited it might be a week before being entirely consumed. Split it up into cord wood, and pile it up loosely, and it would burn in a couple of hours. Again, split it up into kindling wood, pile it up loosely, and perhaps it would burn in less than an hour. Cut it up into shavings and allow a strong wind to throw them in the air, or in any way keep the chips comparatively well separated from each other, and the log would, perhaps, be consumed in two or three minutes; or, finally, grind it up into a fine dust or powder, blow it in such a manner that each particle is surrounded by air, and it would burn in less than a second.' Prof. Peck instanced the burning of the Washburn, Diamond, and Humboldt Mills on the 2d May, 1878, at Minneapolis. This fire was due to the explosion of particles of flour and bran mixed with air, and the force of the explosion was so great as to throw down walls six feet thick, and sheets of iron from the roof of the Washburn Mills were thrown so high in the air that they were carried away by the wind a distance of two miles. He also cited the fire in Greenfield's candy factory, in Barclay street, New York, on the 20th of December, 1877, as one which 'no one need regard as a mystery,' as large quantities of starch and sugar were kept there, and could have been thrown into the air by minor disturbances. Prof. Peck, by numerous and interesting experiments, demonstrated the explosive force of fine dust mixed with air and ignited under proper and favorable conditions. The lid of a box of two cubic feet capacity, with a man standing on it, was raised when flour blown on to a light within was ignited. In a similar experiment, dust from a factory gave similar results."

In the back volumes of the SCIENTIFIC AMERICAN and SUPPLEMENT will be found recorded a number of cases of disastrous dust explosions. One of the most fearful was that which took place at the Albion coal mines, Nova Scotia, last year.

Another Trial of the English Yacht Anthracite.

A recent letter from the Secretary of the Perkins Engine Company, Major George Dean, of London, England, informs us that a third economic trial of the machinery of the little Anthracite has lately been made by F. J. Bramwell, Esq., C.E., F.R.S., assisted by William Rich, Esq., C.E., while the vessel was running under steam on the river Thames. The letter accompanies an extended report of the three rigid trial tests that have now been made, the first and last of which were conducted by Mr. Bramwell, while the yacht was running on the river Thames, and the second, by a Board of United States Naval Engineers, Chief Engineer C. H. Loring, President, pursuant to orders from the Secretary of the Navy, while the vessel was tied to the wharf in the New York Navy Yard, August 13 and 14, 1880.

This vessel was fully described in current numbers of the SCIENTIFIC AMERICAN and SUPPLEMENT, and illustrated in the SCIENTIFIC AMERICAN, under date of August 7, 1880, by means of a large engraving, which shows her in elevation and section, and her machinery somewhat in detail.

It appears from the last report that since her successful voyage to America, the yacht has been fitted with a new propeller, and that she now has beaten her own record both as to power developed and economic performance, yielding a horse-power at the expense of 1·66 pounds of coal, and showing a gross of about 110 indicated horse-power, against 1·7 pounds of coal at the first trial, and 2·7 pounds at the second trial, with, respectively, a gross development of 80·9 and 80·15 horse-power. In regard to the apparently wide difference between the American and the first English tests, the Report of the Naval Board says: "A cursory glance at the cost of the indicated horse-power, in pounds of coal consumed per hour during the two experiments, shows the wide difference between 2·7115 pounds in our experiment and 1·7114 pounds in Mr. Bramwell's, or that the economic results in the latter were $\left(\frac{(2\cdot7115-1\cdot7114)100}{2\cdot7115}\right)=36\cdot88$ per centum superior to those in the former. This great difference, however, is only found when the crude coal is employed as the measure of the cost, and it includes not only the difference due to the condition of the steam (meaning as to superheat) in the two experiments, but the difference in the evaporative power of the coals."

Major Dean in his letter properly says of these trials: "Though differing, all bear such a favorable testimony to the value of the Perkins system, that the comparison will do much to help those interested in steam to judge for themselves as to the advantages claimed."

NEW INVENTIONS.

Messrs. Edward W. Chambers and Thomas P. Burnett, of Springfield, Ohio, have patented an improved chair for theaters, churches, halls, etc., which can be folded very easily and compactly. The invention consists in a chair in which the back is pivoted to the rear end of the seat, which is pivoted to two standards and to the arm rests, which are pivoted to the tops of the standards, so that the back will move toward the standards and the arm rests will be inclined downward, thus occupying very little space when the seat is raised.

An improved washing machine, patented by Mr. Alexander Fleming, of Orleans, Iowa, washes clothes by pumping or forcing water through them.

Mr. James Rankin, of Fairlee, Md., has patented an improvement in guano distributers arranged on the frame of a seed drill; and it consists of a guano hopper provided with a series of openings or slots in its bottom, in each of which slots projects a part of the circumference of a revolving wheel provided with a central groove, which receives and carries the guano to the seed spout, a roll provided with arms and staples and passing longitudinally through the hopper being employed to force the guano into the grooved wheels.

An improved trip hammer has been patented by Mr. Solomon Shetter, of New Cumberland, W. Va. This invention relates to a means for regulating the force of the blow given by the hammer, and for entirely stopping the motion of the hammer with ease and celerity without stopping the engine or other motive power by which the hammer is driven, and without the necessity for shifting a belt from a fast to a loose pulley.

An improved stop-cock has been patented by Mr. John Flanagan, of Newburg, N. Y. The invention consists in constructing a stop-cock with an inclined or slightly curved branch pipe, so that a steam tube can be readily inserted through or a force pump connected with the stop-cock for thawing out or removing obstructions from pipes.

Mr. William T. Hall, of Fayetteville, Ind., has patented a charge holder for firearms, a device for use in loading shot-guns and rifles, which can be more conveniently used than an ordinary powder flask and shot pouch, and by which the arm can be rapidly loaded. The invention consists in a shell or tube of a suitable size for holding a single charge and wad, and fitted with a finger slide for pressing out the wad, so that the charge can be poured into the gun.

Elegant New Western Steamer.

The Louisville *Courier Journal* says of the new Anchor Line steamer: Again the famous Howards, of Jeffersonville, come to the front by building as handsome and fleet a steamboat as ever graced the waters of our rivers. They have built a number of magnificent side-wheel passenger steamboats for the St. Louis and New Orleans Anchor Line, among which we may mention the more recent of which are the Belle of Memphis, City of Helena, City of Greenville, and City of Providence—all of which are noted for their speed, beauty, and elegance. Now they have finished and sent home the new City of Vicksburg, a twin of the steamer City of Providence—an exact copy of the last named steamer. The dimensions of the City of Vicksburg are as follows: Length of hull 280 feet, depth of hold 8½ feet, with 44 feet beam, all oak, well ironed, and fastened extra strong. The guards are 17 feet in width, giving the boat an extreme width of 78 feet and a carrying capacity of 1,600 tons. She has an easy model, with draught light, in running trim, of only 43 inches, making her a great business boat, and a real beauty. The machinery, from the foundry of Ainslie, Cochran & Co., of this city, is a perfect specimen of their handiwork. It is high-pressure, embracing cylinder 26 inches in diameter, with 9 feet stroke; working water wheels 34 feet in diameter, with 15 feet length of buckets. The steam power lies in five main boilers, each 30 feet in length and 44 inches in diameter, with four return flues in each, which give her an abundance of steam, and with her good model and light draught gives an assurance of being very fast. All the appliances required by the steamboat law, as well as those suggested by the advance of the age for safety, are in this boat, including extra boilers for the auxiliary engines—doctor, donkey, and steam pumps. The main saloon is 190 feet in length, 16 feet wide, and 13 feet 6 inches in height, exclusive of the arches. The interior is painted a pure French zinc white in gloss, requiring nine coats, which, together with the gold etchings and reliefs, taxed the utmost skill and patience of the artists in completing its beauties. In contrast or relief the state room doors are of hard wood, polished walnut, decorated or embossed in gold. The texas or upper cabin is 110 feet in length, and admirably furnished for passengers and the officers of the boat.

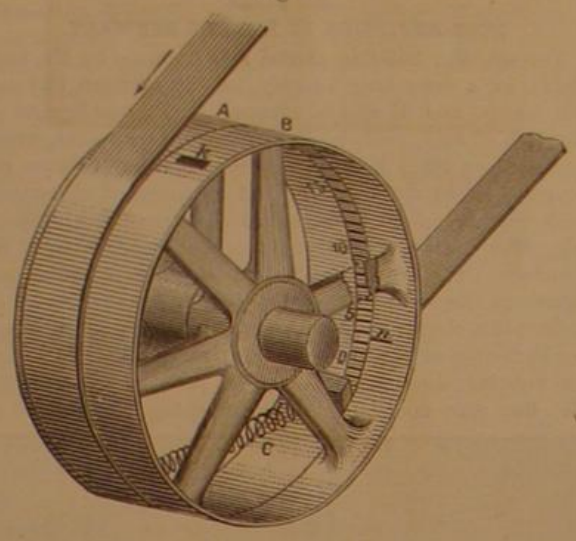
LATCHINOFF'S OPTICAL DYNAMOMETER.

Among the dynamometers employed for measuring the work absorbed by any machine, the one oftenest used is that of Morin, which traces a curve representative of the work. This instrument gives precise indications, but takes up much space.

I have undertaken to construct a dynamometer sufficently simple to be adapted to any kind of a machine whatever.

The improvements that have recently been made in machines for the production of light and in electric motors are rendering more and more necessary an apparatus which shall permit of measuring the effective power expended in setting in motion any given dynamo-electric machine. It is only with a like apparatus that can be determined the best conditions of performance; be compared the value of

Fig. 4.



the different apparatus; and be resolved a host of questions which, up to the present time, have been only approximately answered, their solution demanding a measurement of the work, and the Morin dynamometer being too costly, and too difficult to mount to be readily used.

My dynamometer is applicable to all swiftly revolving machines, and especially to dynamo-electric ones. The following is a description of it:

Upon the driving shaft are placed two pulleys, A and B (Fig. 1), connected with each other by the springs, C (Figs. 2, 3, and 4). A is a loose pulley, and B is fixed to the shaft. The belt, D (Fig. 1), moves the pulley, A, which, in revolving, first stretches the springs, C, and then puts the machine in motion. The stress exerted is measured by the tension of the springs. For estimating this tension I have made practical use of the principle of the phenakisticope, which is based on the persistence of luminous impressions upon the retina.

In the rim of the pulley, B, there is a slit, *k* (Figs. 1 and 4), and opposite to it, on the inside of the same rim, there is traced a very heavy line, *n*, in such a way as not to be hidden by the axle. If, while the pulleys are rapidly revolving, we look at the line, *n*, through the slit, *k*, it appears to be immovable.

Figs. 1 and 2.

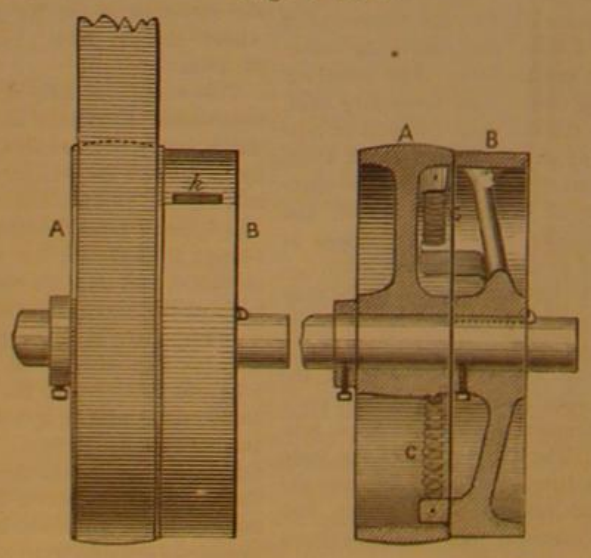
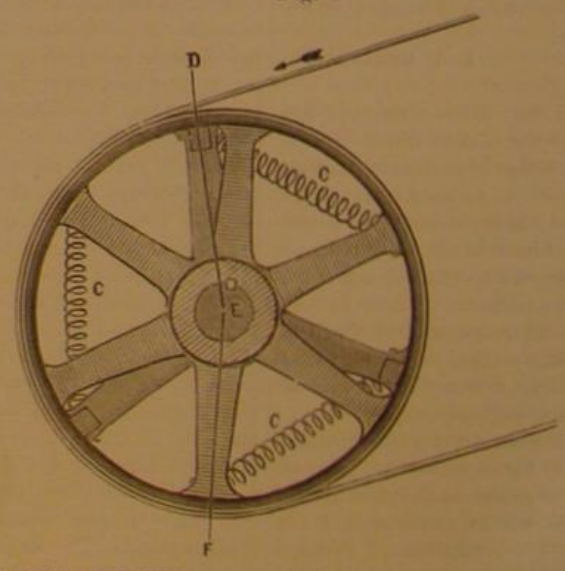


Fig. 3



LATCHINOFF'S OPTICAL DYNAMOMETER.

The inside of the rim of the pulley, A, is provided with a scale, which is made in the following way:

The pulley, B, is made immovable, and against the line, *n*, there is traced on the pulley, A, a zero mark; then, from the loose pulley there are suspended, by means of a cord, weights of five, ten, fifteen, etc., kilogrammes. At the different positions of *n*, corresponding to these weights, there are traced marks which constitute the scale.

During the working of the machine this scale will appear to be stationary, and one may distinctly see what division of the scale the line, *n*, is opposite. In this way it is easy to ascertain in kilogrammes the stress exerted on the pulley.

In order to calculate the work absorbed by the machine it is necessary to know the diameter of the pulleys and the number of revolutions of the machine. If a mechanical counter had to be employed, the process would be inconvenient and not very exact; but fortunately we have excellent trochometers at present which are based on centrifugal force, and which allow of the number of revolutions of the machine being directly read upon a dial, so that a glance through the slit in the pulley and at the dial of the trochometer gives the elements that are necessary to calculate the work. For greater convenience, the scale inside the pulley should be well lighted by a lamp having a reflector.

During the working of the machine the scale will not be absolutely immovable, but will have a backward and forward motion corresponding to that of the steam-engine, because the fly-wheel does not render the working of the machine entirely regular.

I shall not describe in this place the mode of fixing the pulleys, springs, and other parts, since such details are sufficiently indicated by the accompanying figure. I will only remark that the dynamo-electric machine is placed to the left of the pulley, A.

We might also measure the tension of the springs in a purely mechanical way, by causing an index needle to move over a dial by the aid of a screw passing along the shaft. I did at first think of adopting this method, but it seemed to me too complicated, so I abandoned it.

The advantages of my dynamometer are the following: (1.) It is very simple and of small dimensions, and may always remain fixed to the machine.* (2.) It requires no preliminary installation nor any calculation, a glance being sufficient to determine the work. (3.) It may be easily verified by suspending from the pulley, A, different weights, and seeing whether the divisions of the scale correspond with the latter.

The springs, by stretching through long use, may cause a deviation of the zero of the scale; but the divisions will not perceptibly change, even after the apparatus has worked for a long time.—*M. Latchinoff, in L'Electricité Russe.*

ENGINEERING INVENTIONS.

An improvement in car coupling has been patented by Mr. John H. B. McCray, of Blossom Prairie, Texas. This invention relates to self-couplers, and it consists of an open-top hook-shaped draw bar provided with a pivoted T-shaped vertically moving coupling bar, and provided also with an end socket for using the ordinary coupling link.

Mr. George E. Whipple, of Fort Edward, N. Y., has patented an improvement in that means for propelling vessels in which the water is drawn in through a longitudinal channel at the bow by a pump or other device and is discharged at the stern.

An improved direct-acting pumping engine has been patented by Mr. Edward G. Shortt, of Carthage, N. Y. The invention relates to certain improvements in that class of direct-acting steam pumps in which a single plunger is constructed at its upper end in the form of a piston to be acted upon by steam, while its lower end acts within a pump cylinder in connection with suitable ports and check valves, and in which the steam cylinder is in one and the same piece with the pump cylinder and in the vertical line of the same, with a valve chest and gear mounted upon the top of the same and operated through a connection with the piston.

Mr. Charles E. Macarthy, of Forsyth, Ga., has patented an improved car coupling, designed to couple the cars easily and securely by a lever under the car, and projecting at the side of the same, whereby all danger involved in going between the cars is avoided.

An improved packing for piston rods, pistons, etc., designed to secure a greater durability, to take up wear as fast as it occurs, and at the same time to form a tight joint, has been patented by Mr. Edward G. Shortt, of Carthage, N. Y.

An improved locomotive engine has been patented by Mr. Ephraim Shay, of Haring, Mich. The invention consists of a locomotive having its bogie wheels formed with bevel gear teeth combined with a horizontal and longitudinally arranged shaft, also having bevel gear wheels, the shaft being rotated by a direct connection with the engine; also, in novel means for providing for the horizontal and vertical adjustment of the connecting shaft between the crank shaft and the bogie wheels, and in novel means of conveying the power of the engine to said bogie wheels.

An improved machine for passing logs over dams has been patented by Mr. David B. Weaver, of Hopewell Township, Huntingdon County, Pa. This invention consists principally in providing the top of the dam with a strong beam or shaft having any suitable number of radial arms, the beam or shaft being adapted to be turned in its bearings by any suitable means for throwing logs over the dam.

* In order that the springs may not be strained too much, the belt should be kept constantly on the pulley, B, and shifted to the pulley, A, only during experiments.

Professor Sainte-Claire Deville.

The London *Chemical News* gives the following concise sketch of "one who, for the past thirty years, has had few equals and no superior in the fields of mineral chemistry and inorganic analysis." Etienne Henri Sainte-Claire Deville was born March 18, 1818, in the island of St. Thomas, in the West Indies. At an early age he manifested an ardent passion for the study of chemistry, which at that time found in France so many of its most distinguished professors. His abilities were manifested so early that at the age of twenty-six he was commissioned to organize the Faculty of Science, newly created in Franche Comté, and to preside over it as its dean. Here he undertook the analysis of the waters of the Doubs, and of the springs around the town of Besançon, and greatly improved the methods then known for water analysis. Shortly after, he succeeded in preparing nitric anhydride, which previously had been attempted in vain. Toluol was another of his discoveries. In his thirty-third year he succeeded Balard in the chemical chair at the Ecole Normale Supérieure, at Paris. Here his emoluments only reached the modest sum of 3,000 francs; chemistry in France, as well as in England, being supposed to be its own reward. His next researches related to the properties and the industrial preparation of aluminum—discoveries which attracted public attention throughout the world. He then turned his attention with signal success to the metallurgy of platinum, and its separation from its associated metals. His investigations on boron and silicon are also well worthy of notice, and his production of sodium at a cheap price has placed a powerful reagent in the hands of chemists, and has led the way to valuable results, both in the laboratory and in industrial establishments. His highest achievement, from a strictly scientific point of view, was the establishment of the laws of dissociation. Previously, decomposition was regarded as a simple phenomenon, effected and completed, in the case of every substance, at a fixed temperature. Deville showed that in some cases it is effected within certain limits of temperature, being arrested at a given heat by the equilibrium established between the decomposing body and the products of decomposition. A most admirable characteristic of the deceased *savant* was his strict accuracy—an attribute all the more deserving of honor in a man of his ardent and impetuous temperament. Among his pupils may be counted not a few of the most meritorious among the younger French chemists, such as Debray, Troost, Hautefeuille, Grandeau, Gernez, and others. M. Deville died on July 1st, at Boulogne-sur-Seine, and was buried on the 5th. His old friend, M. Pasteur, pronounced an eloquent and impressive *éloge* at the funeral. All honor to his memory, and may his experimental accuracy, which M. Pasteur calls the "probity of the chemist," find abundant imitators.

W. Milnor Roberts.

We are in receipt of the sad intelligence of the death by typhus fever, at Rio Janeiro, on the 14th of July, of Col. W. Milnor Roberts, past President of the American Society of Civil Engineers, and late Chief Engineer of Public Works of Brazil. We are indebted to *Engineering News* for the following:

Colonel Roberts was born in Philadelphia, February 12, 1810. His aptitude for mathematics early introduced him to the then new profession of civil engineering, and in the spring of 1825 he received his first appointment as a chainman of the Union Canal, of which Canvass White was chief engineer, and Sylvester Welch, locating engineer. At 18 years of age he was appointed engineer in charge of the most difficult division of the Lehigh Canal, from Mauch Chunk down, sixteen miles, and from that time forward he was always intimately connected with great canal and railway enterprises, principally in Pennsylvania and New York States, with intervals in Brazil and in the Western States. He held important offices under the United States Government, was Chief Engineer of the Northern Pacific Railway, Associate Chief Engineer of the St. Louis Bridge, and an active and important member of the Mississippi Jetty Commission. In 1879, shortly previous to his departure for Brazil, Colonel Roberts was elected President of the American Society of Civil Engineers, a society of which he was a very active and always interested member, and which will very keenly feel his loss. Though so far advanced in years, Colonel Roberts was an unusually active and energetic man, and some idea of the extent and difficulty of his labors in Brazil may be gathered from letters which have been published in this journal during the past two years. Colonel Roberts was possessed of a most genial and kindly disposition, and the news of his death will be received with feelings of great sorrow by the entire profession of which he was a member, as well as by a very large list of friends in this and other countries where he was known.

Improvement in the Paper Trade.

From statistics presented to the meeting of the American Papermakers' Association, which met at Saratoga on the 27th of July, 1881, it appears that 307 manufacturers had offered 897 tons for export without limit as to price. The increase, according to the report of the committee on export business, in the export of paper in 1880 over 1879 had been 16,500 tons. Statements were also made by prominent members to the effect that the out-put of the paper mills had been fully 25 per cent over that of the previous year, and paper is now sold as low in New York as in London

The total capacity of all the mills in the country is now 2,500 tons per day of all kinds of paper.

NEW RAIL FASTENING.

The engraving shows a new fastening for securing rails and chairs to the railway ties and sleepers recently patented by Mr. Isaac K. Bennett, of Moosup, Conn. Fig. 1 is a plan view of the chair and cushion, and Fig. 2 is a vertical transverse section of the chair, showing the rail in position. The chair, B, is secured to the tie or sleeper by square-headed spikes passing through holes in the bottom into the timbers. A rubber pad, B, is placed in the cavity of the

Fig 1

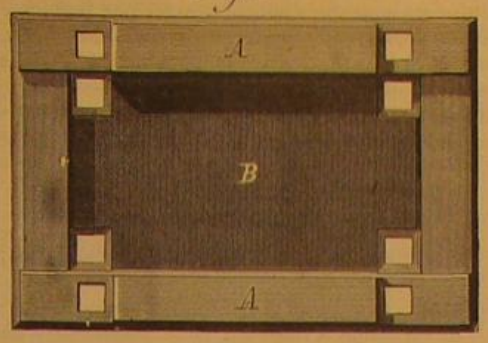
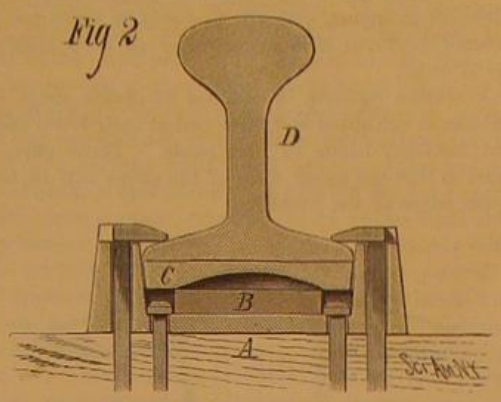


Fig 2



BENNETT'S RAIL FASTENING.

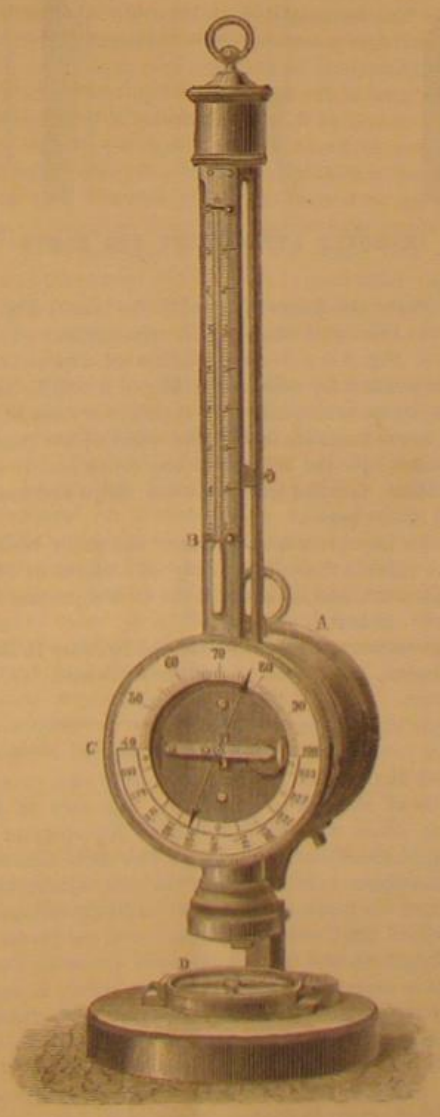
chair and covered with a metal plate, C, which fits the cavity in the chair, and is concaved on its under surface, forming an air cushion. The rail, D, rests on the plate, C, and is secured by hook-headed spikes passing through square holes in the chair into the timbers.

This method of fastening gives great elasticity to the joint and prevents hammering the rails end and bruising the ties.

This device may, with advantage, be applied to the middle or other portions of the rail.

PORTABLE METEOROLOGICAL STATION.

Under this name is designated an instrument especially adapted for the use of travelers in mountain excursions in



PORTABLE METEOROLOGICAL STATION.

order that they may be able to observe and accurately register the different atmospheric phenomena they experience, and so fill the gap that generally exists in the history of Alpine and other ascensions.

This instrument is so arranged that it can, in any place, conveniently and exactly determine the most important meteorological phenomena, the pressure and temperature of the air, and its degree of humidity. It is a combination of a barometer, thermometer, hygrometer, and compass, arranged in a small case that can easily be carried, as it weighs only one kilogramme.

The different parts are so perfectly balanced that the instrument can be used in any position and can stand without injury the rough usage of mountain traveling.

The barometer, A, is the aneroid, a well known instrument, and is especially adapted to show the pressure of the atmosphere and the elevation of the place of observation above the sea level.

The temperature is shown by a mercurial thermometer, B, fixed on a copper tube, that forms a general support for the whole apparatus. The thermometer registers the centigrade system from 25° below zero to 40° above.

The degree of humidity in the atmosphere is determined by a Saussure hair hygrometer, which is slightly modified in this apparatus. A well constructed hair hygrometer gives results sufficiently accurate for general meteorological observations, as the hairs work regularly, and their small bulk causes them to be easily affected by the surrounding air, which is a great advantage when there are only a few moments to make an observation.

This hygrometer is the only one available for those altitudes where the temperature is below zero, and where, consequently, neither the psychrometer nor the condensing hygrometer could be used.

Another advantage is that it shows immediately the degree of humidity, for a table, inscribed on the semi-circumference, C, of the circle, gives in a moment the equivalent of the degrees of the hygrometer in the fractions of saturation of the air.

By this method we can make most interesting comparisons of the humidity of the fogs and mists that are encountered on the mountains and in the vicinity of elevated lakes.

It is easy to see the utility of the compass, D, which shows the position of the country, and is especially useful to the traveler, when exploring an unknown place or surrounded by a heavy fog. The direction of the wind can also be easily ascertained by tying a piece of ribbon to the ring at the top of the instrument, and so making it still more useful.—*La Nature.*

STEAM-BOILER NOTES.

It will be remembered by those who gave attention to the subject of steam-boiler construction, how the steel plates used by Messrs. Elder & Co., of Glasgow, in the construction of the boilers of the Livadia, the Russian war yacht, behaved in the most capricious manner, after having passed the tests that are approved by Lloyds, the Admiralty, and the Board of Trade, and how since that event the attention of civil, metallurgical, and mechanical engineers throughout the civilized world has been drawn to the subject of so-called mild steel as a structural material for engineering works.

According to a recent report on the behavior of the steel plates above mentioned, by W. Parker, Esq., chief engineer surveyor of Lloyds' Register, which was read at a meeting of the Institute of Naval Architects of England, it appears that, up to the date of the Russian event, Mr. Parker and his colleagues of the Lloyds' Register had never observed a single instance of brittle steel plates during their manipulation of 17,000 tons that entered into the composition of no less than 1,100 steel boilers now in use in steamships.

The report shows that, during the construction of these Russian boilers (which were 14 feet 3 inches diameter, with triple-riveted lapped longitudinal seams, plates ¾ inch thick) a plate fell from the slings on to a piece of metal, the shock of which cracked it between the rivet holes at a distance from the place that received the blow; thereupon all the plates were annealed in a furnace specially adapted for the purpose.

The first boiler that was tested after completion gave way in three places before the required pressure, 140 pounds, was reached, and the second gave way in anticipation of the test; in other words, it was found to be cracked by those who were about to test it in a similar manner behind the rivet holes.

In the general chemical analysis which followed their failure nothing seems to have been found to warrant such conduct on the part of these plates. But the appearance of the fracture indicated that the metal was not of uniform structure throughout the thickness of the plate, and a series of special analyses performed on successive layers, each ⅛ thick, plaped off, showed that there was a notable difference in the chemical composition of the middle as compared with the surface layers of the plate. There was more carbon, more phosphorus, and more sulphur in the intermediate layers; of carbon and sulphur they contained nearly double, at the middle, the average quantity of all the layers. Mr. Parker concludes from his investigation that there is nothing but the want of uniformity of structure to account for the singular freaks of these plates. He says: "The tensile strength was not reduced by the punching, but the plates, where punched, were *extremely brittle.*"

In 1848 the ex-Commissioner of Patents, in his report, which was published in the SCIENTIFIC AMERICAN of May 19,

1849, gives it as his deliberate opinion that the best remedy for boiler explosions is making the steamboat masters and other owners of exploded boilers liable for damages, and he recommends that property of such owners be held as a lien to respond to damages to plaintiffs, and that members of corporations be held jointly and severally liable. Whatever may be said of the justice of such legal enactments as the ex Commissioner then recommended, there seems to be little doubt that the effect would be salutary, inasmuch as it would cause steam users to look a little closer into the principles that underlie proper construction and preservation at full initial strength of their steam generators. It would thus promote a community of interests and tend to diffuse correct technical knowledge of the subject, and prevent its concentration among professional experts at whose mercy steam users, as a rule, are now compelled to move.

It appears from the local press of Detroit that the *boiler inspection and engineers' license* ordinance, as originally drawn and vetoed by the mayor, is about to be modified and another effort made to secure its adoption. The suggestions of the mayor relative to inspections will be adopted, at least in part, and provision made for appeal. The local engineers' association, it is claimed, approve the proposition to license them. They are to be divided into three classes, the license fees to be scaled so that they will pay the salaries of an inspector and an assistant.

Wagner's *Jahresbericht* warns against the use of copperas for the prevention of incrustation in boilers, as the acidity of most of the copperas products causes very destructive action of the boiler iron. The use of copperas was some time ago recommended by certain parties, who also patented it, and it has been tried in several works. At the time of its first coming out, a great many parties and authorities in this branch strongly opposed its use, but nevertheless many victims had to pay dearly for the experience they have now acquired. Things of this kind occur too often for our times, and inventions of doubtful merit are too often accepted as valuable additions to industrial purposes. They should be examined, not only by practical, but also by scientific authorities. Practice is a good thing, but theory combined with practice is far better, not only for the pockets of manufacturers, but also for the advancement of industry in general.

A portable steam boiler exploded at Decatur, Ills., on the 28th of July, causing a loss of $1,200 to L. F. Webb; nobody killed.

The locomotive of a freight train on the Chicago and North Western Railroad exploded on the 31st of July, about 14 miles from Milwaukee. A brakeman was killed and the engineer and fireman were severely injured. Five cars were demolished and the rails were torn up for some distance.

Since the explosion of the still at the Woolner Distillery on the 30th of July, Ignatius Woolner, Henry Cashin, Charles Hebner, John Kirkland, William Reif, Henry Goetz, William and Fritz Fehl, William Rice, August Stetler, and Theobold Seiler have died from the effect of injuries received, making twelve persons who have died. Thomas Lawless and William Fehl will probably die, in which case but four will remain out of the eighteen who were injured by the explosion. Nearly all the victims inhaled the escaping steam, and their sufferings have been intense.

The verdict of the coroner's jury is that the explosion was caused by an unnecessary pressure of steam in the still.

At nine o'clock on the evening of August 1, the boiler of French & Son's paper mill, at Carrollton Village, Ohio, exploded, demolishing the boiler house and the bleaching house. The explosion was terrific and threw fragments to a great distance in every direction. The loss is about $3,000. No person was injured.

The boiler in Smith, Grant & Co.'s coal and lumber yard, at Pawtucket, R. I., exploded August 2. Bernard McCudden, the engineer, was blown a distance of forty feet, and instantly killed. He was forty years old, and unmarried.

Improved Hectograph.

The principle upon which the process depends is this, that a superficial tanning of the gelatin, in the gelatin-glycerin pad, makes the surface, wherever tanned or rendered insoluble, capable of taking fatty inks, while the rest of the surface rejects it. In practice then it is only necessary to have a perfectly level hectographic pad, to write the copy with ordinary nutgall ink, to which a little extra tannin and extract of logwood has been added, and to transfer the writing in the ordinary manner upon the hectographic surface. Wherever the writing appears, the surface becomes tanned, and on now applying a roller with printer's ink, the written characters alone take the latter. The pad is to be inked after each impression. It is said that 300 to 400 sharp copies can be made upon dry paper. The only material necessary, besides the hectograph, is a slab, or zinc plate, for spreading out the printer's ink, a small printer's roller with handle, and a roll of wood or paper or rubber for pressing the paper against the pad.

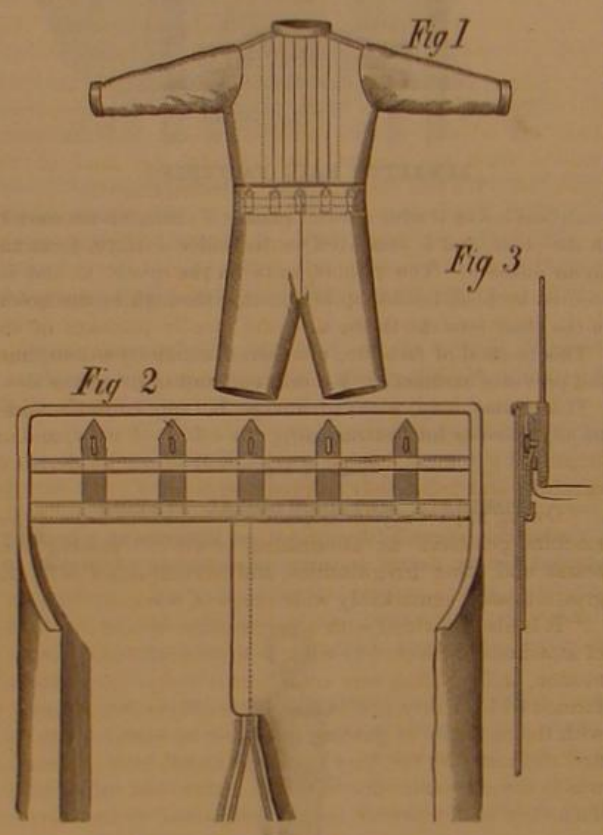
A Naphtha Locomotive.

During the month of June a number of experiments on the consumption of naphtha were made on the Tamboff Saratoff line by the engineer, M. Poretsky. The following points were established: (1.) Steam was got up from cold water to a pressure of 100 lb. on the square inch in two hours, and by burning 4 poods—or 144 lb—of naphtha. Usually in the same locomotive, with coals aided with wood, three and a half hours are required, and 26 poods of coals and wood—936 lb. (2.) The apparatus can be kept in use forty-eight hours without stoppage for cleaning, after which only two hours are required to clean out. (3.) In running 1,500 versts it was only required to stop the locomotive twenty minutes for fuel, and the driver and stoker have almost nothing to do, except to stop and start, the apparatus simply requiring opening more or less of the fuel. (4.) The flame is so well thrown over the whole of the fire box that after running 40,000 versts it is considered only one-half remount is necessary as opposed to coals. (5.) While it was found possible to evaporate 13½ lb. of water with 1 lb. of naphtha, the absolute result with new men and on the whole runs was 9 lb., or about two and a half times more than the coals used.

ATTACHMENT FOR PANTS.

The engraving shows a novel device for fastening pants to waists or vests, so that the buttonholes will not tear out nor the buttons be torn off when the wearer stoops or bends over. The invention is intended more particularly for use on children's garments, and will no doubt be welcomed and appreciated by those who are obliged to keep children's clothes in order.

The invention consists in a series of elastic strips with buttonholes at the upper end, attached at their lower ends to a band fastened inside of the pants. These parts are arranged so that the upper ends of the strips will be below the upper edges of the pants.



IMPROVED ATTACHMENT FOR PANTS.

Fig. 1 shows the pants attached to the waist; Fig. 2 is a view of the inner side showing the arrangement of the fastening, and Fig. 3 is a vertical section of a portion of the pants and waist. By reference to Fig. 2 it will be seen that the elastic strips are attached by their lower ends to a band fastened to the inner surface of the waist of the pants, and a band passes over the middle of the strips and is stitched between them, forming guides for the strips and sustaining the waist of the pants.

With this improvement the wearer can easily bend in all directions without fear of bursting off buttons or of injuring the garment, and it improves the fit and general appearance of the clothes.

This invention was recently patented by Mary R. Barhydt, of Burlington, Iowa, who should be addressed for further information.

A Minnesota Meteor.

A comet-like meteor, which appeared to pass close to the earth without striking or exploding, was seen in Eastern Minnesota, about 8:30 P.M. July 25. An observer at St. Paul, Mr. T. D. Simonton, says: "The meteor came from the south-eastern heavens, below the star Altair, some 15° or 20° above the horizon. It was exceedingly brilliant, with a well-defined head, as large or larger than the planet Venus at her brightest, and seemed to move about as fast as a rocket at a square's distance does just before it explodes. There was to me a sense of retardation in its movement, just as there is in a case of a rocket; but this was probably only apparent, because it looked so much like a bright rocket ready to explode, and because, in fact, I was expecting to see it explode every instant. Its direction was toward the north-west, toward which it crept as a fiery serpent, disappearing some 10° above the horizon. I use the word 'crept' because its movement was in no sense the darting motion of the ordinary meteor, but a deliberate, majestic course, giving one a great sense of the power with which it moved through at least 100° of the heavens. At its highest point I should think it was about 30° above the horizon. My estimate of the time the meteor was visible is from six to eight seconds, certainly not ten seconds. The tail was probably 10° in length."

A REMARKABLE CASE OF RETARDED DEVELOPMENT.

BY PROF. C. V. RILEY.

Early in the summer I received a statement from Professor I. D. Graham, of the Kansas State Agricultural College, at Manhattan, to the effect that he had hatched out some young locusts from eggs which had remained latent since the fall of 1876. While the occurrence did not strike me as impossible, it was, nevertheless, so remarkable that I entered into correspondence with him with a view of getting absolute proof of the accuracy of his statements. The young locusts which he sent me for identification proved to be *Caloptenus spretus*, or the destructive Rocky Mountain locust, and all the facts connected with them are so well attested that there is no doubt in my mind as to their trustworthiness.

About the 15th of September, 1876, the Chemical Laboratory Building of the Kansas State Agricultural College was completed, and the grounds immediately surrounding it were graded.

In the process of grading the bits of stone, mortar, and the clay which remained after the excavations and work of building had been completed, were used. The eggs of *Caloptenus spretus* were found in large numbers, and when the college grounds were graded, many of them were buried. The specimens in question were buried to a depth of about 10 inches, and remained in that condition until the third week in May, 1881, when some workmen, who were regrading the grounds, discovered them. As they looked quite fresh after their long burial, Mr. Graham concluded to try the experiment of hatching them out. He placed them under favorable conditions, and in due time was rewarded by the appearance of an active brood of young locusts, of which he forwarded samples to me.

When discovered in May, these eggs were surrounded by black earth. This earth was enveloped in closely packed clay, which, in turn, was covered with "spalls," mortar, and other building rubbish. In 1876, when the grading was finished, a plank walk was laid alongside of the building and above the buried eggs. This walk had never been removed since that time until in May, 1881, when the eggs were found.

In view of all the facts in the case Mr. Graham believes that the walk so shaded the ground that the sun's influence did not penetrate very deeply into the earth at this point, and also that the peculiar composition of the earth surrounding the eggs, would keep them cool, moist, and in an almost air-tight place, all of which are conditions favorable for preservation.

However this may be, the fact that the eggs did remain in the ground unhatched for nearly four and a half years seemed undeniable, as also the further fact that the young when hatched were as active and voracious as their remote parents had been. The question arises as to how much longer eggs so situated might have remained undeveloped and sound, and it opens up a most interesting field for experiment.

It is not my purpose to discuss here the general influence of temperature in accelerating or retarding animal development, nor the many curious cases of retarded development among insects that are totally independent of temperature. Semper, in his recent work on Animal Life, has an excellent chapter on the influence of temperature, especially as to the optimum required for the favorable development of different species. As a rule a rising temperature stimulates and accelerates growth and development, and a falling temperature retards or torpifies, and this holds true with the eggs of *Caloptenus spretus*, as I have shown in experiments recorded in my ninth report on the insects of Missouri, and in the first report of the Entomological Commission. But there are many strange exceptions, as in the heat coma of tropical animals, the summer dormancy of certain lepidopterous larvæ, and the retarded development of individuals placed in the very same conditions under which others normally develop. There is, therefore, much mystery yet connected with the subject which offers a most inviting field for experiment, not only as to the other influences affecting retardation, but as to the length of time development, as under the influence of continued cold, can be kept latent without loss of vitality. The case here recorded is consequently most interesting, for it is evident that the eggs were not buried deep enough to be entirely free from the changes in the temperature of the earth at different seasons.

Washington, D. C., August 1, 1881.

Spiders Obstruct the Telegraph.

One of the chief hinderances to telegraphing in Japan is the grounding of the current by spider lines. The trees bordering the highways swarm with spiders, which spin their webs everywhere between the earth, wires, posts, insulators, and trees. When the spider webs are covered with heavy dews they become good conductors and run the messages to earth. The only way to remove the difficulty is by employing men to sweep the wires with brushes of bamboo; but as the spiders are more numerous and persistent than the brush users the difficulty remains always a serious one.

AMERICAN INDUSTRIES.—No. 74.

THE MANUFACTURE OF SEWING MACHINES.

Not the least prominent among those American manufactures which have made the reputation of our mechanics and inventors so well known throughout the world is that of the sewing machine. Not only was it here that the invention had its birthplace, but through all the succeeding years we have been adding improvements to enlarge the variety and perfect the quality of its work, to make it run more easily and more rapidly, and to lessen its cost while increasing its durability. Thus it is that, beside supplying our home demands with a greater variety of machines for especial uses than are known in any other market, we have not only furnished the models from which most of the European manufacturers now work, but we have, from the commencement of the business to the present time, steadily been large exporters of sewing machines and sewing machine parts.

In the illustrations on the first page of this paper we present views of the leading operations in their manufacture, as conducted by the Davis Sewing Machine Company, of Watertown, N. Y. This machine differs from most others in being what is known as a "vertical feed," that is, while the feed motion in other machines is commonly communicated by a horizontal under feed with a complicated movement, in this machine the work rests upon the perfectly smooth surface of the bed-plate except as it is moved forward by the stepping of the vertical feed in connection with each up-and-down movement of the needle. The company own the patent on this principle, and claim for it decided advantages over the under feed motion, as, in the latter, the feed moving while the presser foot is upon the goods, the under-ply will be carried forward faster than the other, the tendency being to cause a "gather" in the lower piece, so that it will yield more readily to the upper in any strain upon the garment, and thus prevent the making of a perfectly strong and elastic seam. In this vertical feed the presser foot is raised from the fabric when the feed takes place, so as to present no resistance to seams or ridges; the needle is in the fabric when the feed moves, and so helps carry the work along firmly and make the stitches of uniform length, and it is claimed that the machine is capable of sewing elastic goods, making a smooth and flexible seam with stitch alike on both sides, and also that it will sew any number of thicknesses without basting, working as well on the heaviest as on the lightest fabrics.

To one ordinarily conversant with the mechanical details of the sewing machine the view of the new No. 1 Davis machine, as shown by our artist, will be easily understood, and the motion of the vertical feed with the needle bar readily comprehended, as may also be said in regard to the tension wheel and check spring on the upper thread, the tension on the lower thread being regulated in a simple way by a pad spring on the under side of the bobbin in the shuttle beneath the bed-plate.

Of the manufacturing details in the construction of the machine, we give a view of one of the large machine rooms, where lathe work, milling, grinding, drilling, and many other operations are conducted, to give an exact fit and proper finish in all the working parts of the machine. The division of labor, for the attainment of the greatest possible excellence in the minutest detail, is the leading idea in the conduct of this part of the work, the different pieces being interchangeable, and all being inspected, tested, and gauged before finally passed. Many of the pieces subjected to most wear in the operation of the machine have hardened steel parts, and although there are fewer pieces in this machine than in many others, the working parts being mostly in the head of the machine, the design is to make it strong and durable as well as simple.

The putting on of the hard, polished black surface, shown in the representation of the japanning, is a department by itself. The japan is put on with a brush, in successive coats, the pieces being baked from ten to fifteen hours after each coat in an oven kept at a temperature of from 350° to 380° Fah. After this process the pieces to be ornamented go to another department, where a wide variety of decorations are put on them, either in painting, bronzing, gold leaf, or by the now very popular decalcomanie or transfer process. Great improvements have been made in this branch of the business within a few years past, so that the most tasteful ornamentation now costs but a fraction of what was formerly paid for the most ordinary work.

In the "assembling" of the machines, all of the work which has preceded is, to some extent, looked over and tested, except that connected with the setting up of the tables on their stands. In connection with the assembling is what is called the "jacking," that is, the machines, as put together, are, at different times during this part of the work, placed upon jacks, or frames driven at a high speed, and run for a sufficient time to enable the inspector to see that all the parts are properly adjusted. After this each machine is threaded and actually tested on a sample of work, and a machine coming direct from the hands of the manufacturers is always found with such sample under the presser foot.

In the multitude of sewing machines which have been placed upon the market it would be invidious to attempt any comparison here, covering so large a field. The Davis Company claim that their machine is better adapted to a wider range of work than are the under-feed machines, and the attachments they have cover devices for nearly everything yet done on a machine, from gauging and hemming to ruffling, tucking, and fancy embroidery. The company also point with considerable pride to the fact that they obtained the only first award of merit at the recent Exhibitions at Sydney and Melbourne, Australia, where several leading machines were represented.

At the most recent of the International Exhibitions, that held at Melbourne, Australia, the Davis machine last spring took the first award; the representatives of seven other machines appealed from this decision, and experts were then appointed to make a special examination, which resulted not only in confirming the award, but brought out the following report from the jury:

"The competition in sewing machines proved very keen, and great interest was evinced both by the representatives of the makers and the public in the result of the trials. The machines were removed from the stand, and were submitted privately to the jury, and their various qualifications explained by skilled operators. The jury then retained possession of them for some time, and at their leisure examined the workmanship and material, testing the latter for hardness by use of a file.

"Among domestic machines the highest place was awarded to a machine comparatively new in the Melbourne market, though by no means untried elsewhere, and known as the Davis vertical feed sewing machine. In this machine the shaft, pulley, and flywheel occupy the same position relatively to the other parts as in the well-known Singer form, and the vertical motion of the needle bar is produced by the usual crank pin moving in a heart-shaped cam; here, however, the resemblance ends, and the mechanism is of a most novel and curious kind. The shuttle, which moves in a curved path, is operated by a system of jointed levers proceeding from a small eccentric placed on the shaft immediately behind the driving pulley, thus dispensing with the miter wheels and vertical shaft hitherto so general. The feed apparatus is entirely removed from the usual position beneath the table of the machine, and is attached to the head. It consists mainly of a vertical bar placed close to the presser foot, and which receives suitable vertical and horizontal motion from mechanism contained in the head of the machine. We find the other points entirely novel:

"First. The presser foot, instead of being continuously urged downward upon the work, is lifted slightly at the instant that the forward motion takes place.

"Second. The feeding is accomplished while the needle is in its lowest position, and the needle partakes of the forward motion of the feed bar, pinning the two ules together and causing both to advance equally.

"The machine is also provided with a very complete series of adjustments for counteracting the effect of wear, and an improved automatic bobbin winder, and in all its details is carefully and judiciously worked out.

"Owing apparently to its peculiar feed motion the Davis machine possesses an astonishing power of passing over seams and other irregularities, and accomplishes with the greatest ease a remarkably wide range of work.

"It is also provided with a very ingenious and novel set of attachments adapted to work in unison with the new feed motion, and enabling very complicated operations to be performed with facility, and in many cases dispensing altogether with the necessity of guiding the work by hand. It was at first supposed by the jury that this excellent performance was in some measure due to the special skill of the operator. This view was, however, entirely negatived by the fact that a change of operators in no way impaired the result.

"The Davis machine is made for either foot or hand power, and performed equally well in each case. To it the jury awards the first order of merit as being prominent for simplicity, convenience, efficiency, and rapidity, both as a treadle and hand machine."

A good idea of the extent of the works of the Davis Sewing Machine Company is afforded by the illustrations on the first page, although it should be stated that most of the castings and all of the cabinet work are made outside by contract, leaving all of the facilities of the establishment for employment on that which is more directly machine work. The company was established in 1868, and from a small beginning then, the business has steadily grown, new buildings being erected and additional hands and machinery employed as called for by the growing demand. The works have not been stopped since their commencement, but their production has largely increased each year, even through the times of severest commercial depression.

The Company are represented by agencies in the principal American cities, and in Switzerland, Russia, and Australia.

Gas from Castor Oil.

At the gas works of Jeypore, India, illuminating gas is made chiefly from castor oil, poppy, til, or rape seed being used when the supply of castor beans is short. One maund (82 pounds) of castor oil produces about 750 cubic feet of 26½ candle gas, or 1,000 cubic feet of 18½ candle gas. The process of extracting the oil for carbonizing is as follows: First, the castor seed is passed through the crusher, when the shells only are broken off. The shells are then picked out by hand, and the seed is again introduced into the crusher, where it is ground to a paste. It is then passed into the heating pan, and, after being well heated, it is packed into horsehair bags and filled up hot into the press immediately. After about twenty minutes' pressing, the exuding oil being meanwhile collected, the cake is removed and ground over again. It is subsequently heated and pressed a second time until about 33 or 40 per cent of oil is obtained from the seed. The labor of preparing and pressing the castor seed costs two shillings (about fifty cents) per maund of oil. The total cost of the oil is somewhat over $5 per maund.

For generating gas, the oil is used as it comes from the press. Formerly, at other places, when the oil-bearing seeds were carbonized for gas without previous treatment as above described, the product was overloaded with carbonic acid from the woody part of the seeds, and correspondingly heavy cost for purification was incurred.

For out of town consumers the Jeypore gas works supply gas compressed to about three atmospheres by means of a pump driven by a bullock. The compressed gas is then delivered in a wrought-iron receiver to the point of consumption, where it is either transferred into fixed receivers and burnt by the aid of suitable regulators, or is delivered into small portable or service gasholders, and burnt in the usual way. A *ghat*, or landing-stage, two miles distant, is thus supplied with 400 cubic feet of gas every day, which is consumed by 30 jets, each burning 1½ cubic feet per hour for nine hours. There have not been any accidents from the distribution of gas in the portable reservoirs or otherwise. As railroad carriages are also supplied with compressed gas, it is evident that the introduction of this branch of service has widely extended the utility of the establishment. Another peculiarity of the Jeypore undertaking is the necessity that exists for the manager to unite the attributes of a farmer to his other acquirements, for the purpose of securing a constant and cheap supply of raw material for gas making. Last year, the manager, Mr. Tellery, personally superintended the sowing of 300 acres with the castor plant (*Ricinus vulgaris*).

RECENT INVENTIONS.

An improvement in the class of scrapers having wooden sides and a body constructed of steel or other thin metal, has been patented by Mr. William Haslup, of Sidney, O. The features of improvement and novelty are the means for connecting the sides and body both at the bottom and back of the scraper and the devices for attaching the bail.

An improved pocket knife has been patented by Mr. August Rischow, of Elizabeth, N. J. The object of this invention is to prevent the blades of pocket knives from being raised accidentally and from folding or collapsing while the knife is being used. The invention consists in a handle with longitudinal slots, in which bars fit, which are pivoted to the lower ends of the knife blades, which slide between suitable guides in the handle, and are provided with suitable packing.

Mr. Alexander Watson, of East Pepperell, Mass., has patented a combined coal hod and sieve, by the use of which partially burned coals may be cleared of ashes without raising dust.

An improvement in sash fasteners, patented by Mr. Stephen P. Rush, of Tyrone, Pa., consists in the peculiar arrangement of parts whereby the lower sash is locked when down and the upper sash locked when raised by the movement up and down of the sashes; or either sash may be locked in a partially raised or lowered position.

An improved method of preparing and welding pipe sections has been patented by Mr. Henry V. Hartz, of Cleveland, O. This invention relates to a novel method of preparing and welding together sections of metal pipe or tubing. It is designed more particularly for welding short sections on to old boiler tubes, so as to give them sufficient length to permit them to be again reset in the same tube sheets, the old tubes being too short to be reset without lengthening. The ordinary method of resetting old tubes is to mill down or hammer one end of a section of tube to an entering bevel or male end, and expand by hammering or milling the end of the other section to a tapering or female end adapted to receive the male end, after which they are joined and welded together by hand. The difficulty attending this plan is that much labor is required to prepare the ends, and the time required to turn and weld the sections on all sides is such that the heat decreases at the end of the operation, so as to fail to secure the most perfect uniting of the parts, and both skilled workmen and hand labor are required for the work. The invention referred to consists in simultaneously cutting off and scarfing or beveling the male or entering end by rolling a bevel channel around the tube on a mandrel, and continuing this rolling action until the section is severed, and at the same time holding down the metal on each side of the bevel channel to prevent enlargement of the cut ends; then in a second operation cutting and expanding the female end simultaneously by rolling a bevel channel around the tube on a mandrel, and continuing this rolling action until the section is severed, and at the same time allowing the metal on each side of the bevel cut to spread or move freely, to permit the cut ends to be expanded, by the mashing action of the roll, to a diameter large enough to receive the male end.

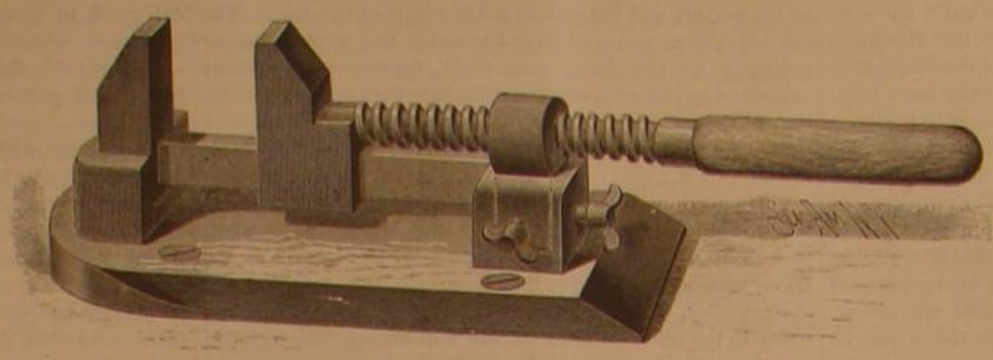
Anchors, as usually made, have two rigid flukes projecting in opposite directions from one end of the shank, an eye or ring at the other end, for connection of the chain, and a stock passing through the shank at the end where the chain is connected. Such anchors hold by either fluke, and, as will be readily understood, the fluke end will be lowest in the bottom while holding, the other end of the shank remaining above or being in the bottom but a short distance. Mr. John J. Moule, of Fishkill-on-the Hudson, N. Y., has patented an improvement, the object of which is, first, to cause the anchor to sink throughout the whole length of the shank and to give a hold on the bottom at both ends of the shank; second, to prevent the chain from fouling on the stock.

A NEW TOOL.

The engraving shows an improved tool which can be used either as a monkey wrench or bench vise. The wrench consists of a square bar, having upon one end a fixed jaw, and upon the other end an arm having a screw-threaded opening which receives the screw for moving the adjustable jaw placed on the square bar. The wrench is capable of being used like any ordinary wrench, and when it is desired to employ it as a vise it is held in a bed plate, arranged to clamp the bar of the wrench both lengthwise and sidewise.

This invention will be found very useful to those requiring a wrench and vise occasionally, and by mechanics who are frequently using both tools.

Further information may be obtained by addressing Mr. William H. Love, Love's Station, Miss.



LOVE'S COMBINED WRENCH AND VISE.

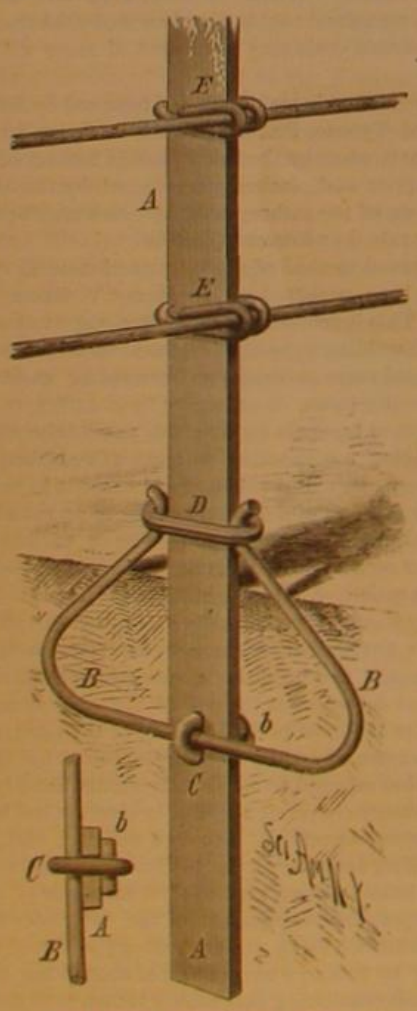
A Good Day's Work on a Railroad.

The work of changing the gauge of the Chicago, St. Louis, and New Orleans Railroad, between Cairo and New Orleans, was begun at 4 o'clock of the morning of July 29. The work was finished and trains were running at 3 o'clock in the afternoon of the same day. The work consisted in shifting the west rail 3½ inches, making the gauge 4 feet 8½ inches. The length of road changed was 571 miles, exclusive of sidings. About 2,500 experienced workmen were employed in gangs, each gang having charge of eight miles of track. The division from Cairo to Milan, 84 miles, was changed by 8:50 A.M. The division from Canton to New Orleans, 206 miles, was completed at 9:20 A.M. The work was in charge of Col. L. P. Brien, and was accomplished without mishap or delay.

AN IMPROVEMENT IN IRON FENCES.

The improvement in iron fences, shown in the annexed engraving, has recently been patented by Mr. Samuel Heaton, of Cedar Rapids, Iowa. It is noteworthy principally on account of its simplicity and cheapness. The post has but one aperture, and that is made so near the lower end as to have no effect on the strength of the post, and the braces and rods or wires are fastened by a very simple and effective means.

The post consists of a piece of flat bar iron, having an oblong hole punched in it near the lower end. The brace



HEATON'S IMPROVED FENCE.

consists of a curved piece of round bar iron, bent into approximately triangular shape, having its ends at the open angle, bent outward to receive the link which binds the ends to the post. The brace is attached by slipping the link over its free ends, and then passing the post through the link between the ends of the brace. The lower part of the brace is secured to the post by a link, previously placed upon it, which passes through the slot in the post and receives a key or wedge upon the opposite side.

The wires or rods forming the bars of the fence are secured by loops or staples which embrace the post and are bent around the wire.

The advantages of a post of this description will be readily understood without further description.

The Faure Battery.

Some personal feeling must exist in the minds of the French writers on electricity against M. Faure, judging from the way in which they compare his secondary battery with M. Planté's. Any one who chooses to test the Faure cell and the Planté cell cannot fail to be convinced that the former is decidedly the better one. Sentiment, passion, and prejudice enter so largely into what ought to be the calm reason of the French people that one is compelled to receive their conclusions regarding anything with some neutralizing substance—an acid or an alkali, as the case may require. In the Faure case the declarations of French electricians must evidently be accepted by minds otherwise constituted not simply with a grain, but with an overwhelming dose of salt. Prof. J. A. Fleming, of the University College, Manchester, England, says candidly that "the enormous superiority of M. Faure's cell over the old form of Planté's cell is evident at once on experimenting with it." And, by the way, Prof. Fleming is justly entitled to the credit of devising the following admirable method of showing large assemblies the action of the Faure battery, about the end of last June, before he had the opportunity of looking over M. Faure's patent papers. His own words are given with one bracketed qualifying clause: Sheets of lead were bent up into the form of shallow trays one foot square and one inch deep; in each of these was placed a layer of red lead, then a layer of flannel, then a layer of red lead, and, lastly, another lead plate. These trays, to the number of six, were then piled one above the other after being filled with dilute acid. The cells, being connected in series, were polarized by a ten cell battery of Grove's cells, and after twenty minutes charging had taken up [or rather had induced conditions of remanifesting] a very large quantity of electricity. At a short lecture during the evening the charged Faure battery was connected with a Gramme machine and drove it round with considerable velocity for some minutes. After thus employing part of the charge the remainder was used for heating several inches of platinum wire, and for driving for a few seconds a simple form of magneto-electric engines. These experiments amply confirmed those present of the practical character of M. Faure's invention.

MISCELLANEOUS INVENTIONS.

An improved swimming apparatus has been patented by Mr. William Beeson, of Dillon, Montana Ter. This invention relates to a novel construction of swimming apparatus, and it is in the nature of a detachable suit provided with pockets or receptacles for the body and limbs, and having between the pockets for the limbs a web portion, which acts like wings or fins, which, from the movement of the legs and arms, effect a propulsion through the water.

An improved pillow or bolster has been patented by Mr. William T. Doremus, of New York city. The object of this invention is to prevent the stuffing of pillows and bolsters from being crowded out of place by pressure applied to parts of the pillows or bolsters. The invention consists of a pillow or bolster made with an inner cover filled with stuffing, and an outer cover having a layer of stuffing interposed between it and the said inner cover, whereby the stuffing will be kept in place when under pressure.

An improved switch for butchers' tracks has been patented by Mr. Charles Cole, of West Newton, Mass. This invention relates to an overhead track on which runs trucks provided with hangers, upon which heavy articles can be suspended beneath the track and readily moved from place to place; and its objects are to provide a convenient way to connect the main track with the branches which extend to different parts of the room or inclosure, and to provide a convenient method of shifting such connecting main track from connection with one branch to connection with another.

An improvement in shipping cases has been patented by Mr. Charles R. Peaslee, of Louisville, Ky. This invention is an improvement in the class of shipping cases for large oil cans, in which interior grooves are provided for reception of the gudgeons or pivots of the can for the purpose of protecting them while the can is being shipped.

Mr. James H. French, of Willimantic, Conn., has patented an improved package for fire kindlers which will prevent the evaporation of the turpentine and other volatile substances contained in the kindlers.

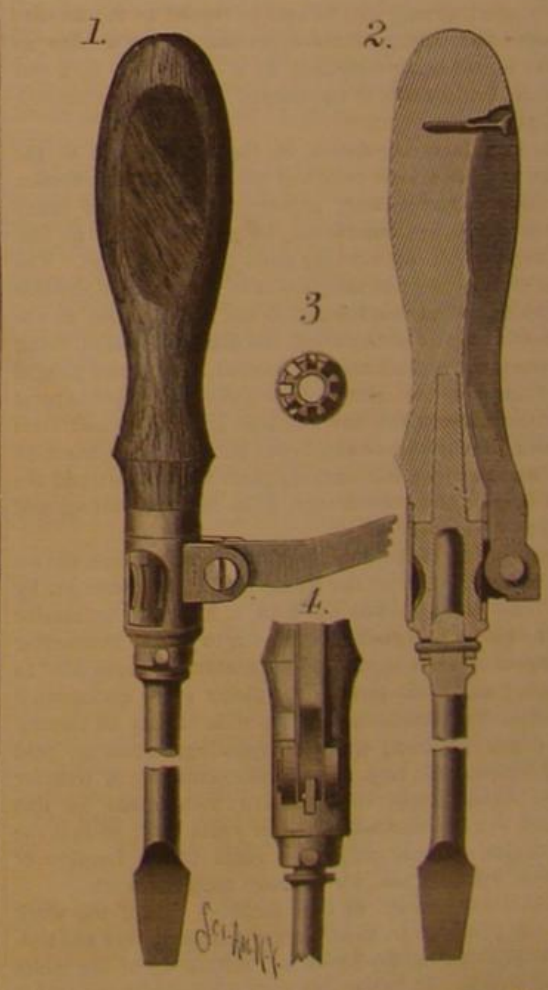
An improved cushion has been patented by Mr. William T. Doremus, of New York city. The object of this invention is to prevent the displacement and the packing of the stuffing in cushions for beds, lounges, chairs, and other articles of furniture. The invention consists of a cushion made of two or more small elastic parallel rolls connected along their adjacent sides, whereby the elastic material forming the stuffing is kept from being displaced and becoming packed.

A HANDY TOOL.

Slotted head machine screws, which leave the work flush by sinking the heads, are much used in machinery and tool construction, and sometimes are of so large diameter and such length of threaded portion as to present considerable resistance when nearly seated. The use of a wrench on the blade of the screw driver to give additional leverage is a coarse and makeshift method of overcoming the resistance, and, in many instances, is inconvenient, as the crowded position of the screw makes it difficult to get the necessary half or quarter turn.

The object of the improvement shown in the engraving is to obviate these difficulties and provide a handy and useful implement, which will not only take the place of the screw driver and wrench, but will serve as a substitute for the cumbersome and heavy ratchet wrench. It has all the advantages of a ratchet wrench in making short movements, and all the uses of the screw driver in driving the screw in the ordinary manner by means of the usual style of handle.

It is really a screw driver handle, with fixed steel socket, to receive the shanks of the screw driver blades, or of socket wrenches, as desired. On the socket is a sleeve that turns freely and covers a ratchet, or rather a square-toothed pinion, secured rigidly to the steel socket. There is pivoted to the sleeve a steel lever, which, when not in use, shuts into a recess in the wooden handle, and when thus shut the entire implement is only an ordinary screw driver, neither the ratchet nor the pivoted lever taking any part in its action. When used thus, as an ordinary screw driver, it merely drives the screw until the resistance becomes too great, when the lever, in connection with the ratchet, is brought into action. For this purpose the lever is allowed to swing out of the handle, and as it assumes a horizontal position its pivoted end, as a tooth, engages with the toothed ratchet inside the sleeve, and gives means for a leverage corresponding with the length of the arm, which may be nearly



SCREW DRIVER WITH LEVER ATTACHMENT.

that of the screw driver handle. A very slight movement of the lever serves to disengage it from one tooth and engage with the next, or with any other, the gradations depending on the number of teeth in the ratchet. A movement of one eighth of an inch, demanding eight teeth, is generally sufficient for the most cramped position. But a larger number of teeth in the ratchet, and a consequent shorter movement of the lever, may be had if necessary, or, if circumstances warrant, the lever may be swung so as to get one-quarter or one-half, even, of the circle.

Mr. L. E. Rhodes, the inventor, is a practical mechanic, in the employment of the celebrated Pratt & Whitney Company, Hartford, Connecticut. The implement has had sufficient trial and use to establish its value in the shop.

A New Safety Lamp.

Mr. Fleuss, the inventor of the diving helmet known by his name, and by means of which a man can take oxygen enough with him to remain under water more than an hour, has recently devised a new safety lamp based on the same principle. It is about twelve inches in height, and is composed of a stand, oxygen chamber, spirit tank, and cover. The oxygen chamber is spherical in shape, and is made of strong copper. It contains oxygen pumped in at a pressure of 260 pounds, and its outlet is a small pipe, furnished with an escape valve and regulator, opening close to the wick. Above the sphere is a little square tank containing methylated spirits for burning in the lamp, and upon it is closely screwed a socket holding the wick. Close to the wick is a thin iron rod, upon which is fastened, in the usual manner, a piece of lime. When the wick is lighted a stream of oxygen is turned upon it from the little pipe by means of the regulator and valve, and the flame is blown upon the block of lime, the light produced being of the most intense kind.

Over the lighted wick, the oxygen blowpipe, and the rod of lime a strong copper casing is screwed down, and the light is thrown through a bullseye in the side of this cover. The casing is dome-shaped, and is made with a double skin, the intervening space being filled with water. On the lower part of it is an outlet valve, by means of which the products of combustion are permitted to escape into the water between the skins of the case, and to find their way through it into the outer atmosphere, an escape valve on the top of the cover being the ultimate means of egress. The lamp is said to have borne all tests with most satisfactory results. It heats little, and is easily managed.

Deep-sea Soundings.

Captain George J. Belknap, commanding the United States steamer Alaska, reports to the Navy Department, under date Callao Bay, July 6, 1881. He gives detailed results of soundings in a run of 112 miles directly off shore. At a distance of 102 miles he found a depth of 3,368 fathoms, or nearly four statute miles, the deepest water yet found in the South Pacific, or in the eastern margins of both the North and South Pacific. Hoping to find a still deeper depression of the ocean bed he stood ten miles further to the westward, but only found 3,168 fathoms. In both casts the specimen cylinder brought up clay and greenish sand, and the bottom temperature of the deepest was about 34° Fah.

Grasshoppers in Turkey.

Turkey, it appears, is overrun with grasshoppers, and the government has been compelled to employ extraordinary measures to overcome the plague. A particularly voracious species has appeared in the Bodirum District (Smyrna), and the whole population is employed to combat the insects. At Angora all business was suspended for three days by order of the Governor-General, and all the inhabitants were ordered to march out into the fields to destroy the grasshoppers. Every inhabitant was compelled to deliver twenty oka (about fifty-six pounds) of dead grasshoppers to the officials. The swarms are said to emanate principally from Persia.

Remarkable Swarms of Dragon Flies.

In some parts of Germany dragon flies have been unusually numerous. At Kamenz, during the last days of May, enormous swarms of them, here and there in dense masses, and extending from five to ten miles in breadth, passed over the valley. The first swarm arrived about noon on May 30; its passage occupied two hours. In the evening a second swarm came from the direction of Weisswasser. The third swarm arrived on the morning of the 31st. Swarms of this description have not been observed since June, 1825. At Dresden the strange phenomenon was also observed.

Supposed New Species of Horse.

M. *Poliakoff, the* distinguished Russian naturalist, has examined a horse presented by Colonel Prejvalsky to the St. Petersburg Academy, and decides it to be a new species, which he has named Equus Prejwalskii. It appears that the new representative of the family of undivided-hoofed mammals is in some respects intermediate between the domestic horse and the wild ass, but it differs from the asinine genus in having four callosities, one on each leg. In the form of skull, absence of dorsal stripe, and other particulars, it resembles the domestic horse. This newly recorded animal is indigenous to the plains and deserts of Central Asia, and has not hitherto fallen under the dominion of man.

EARTH STARS.

Among the curious and interesting things that one fond of rambling over the sand dunes of Coney Island will meet with are the earth stars.

Nothing can be more puzzling to one unacquainted with such matters than to find a star-like plate lying flat on the sand, or with its points curved, as in Fig. 1, and bearing on its center a more or less globular body. At first sight we

Fig. 1. Fig. 2.

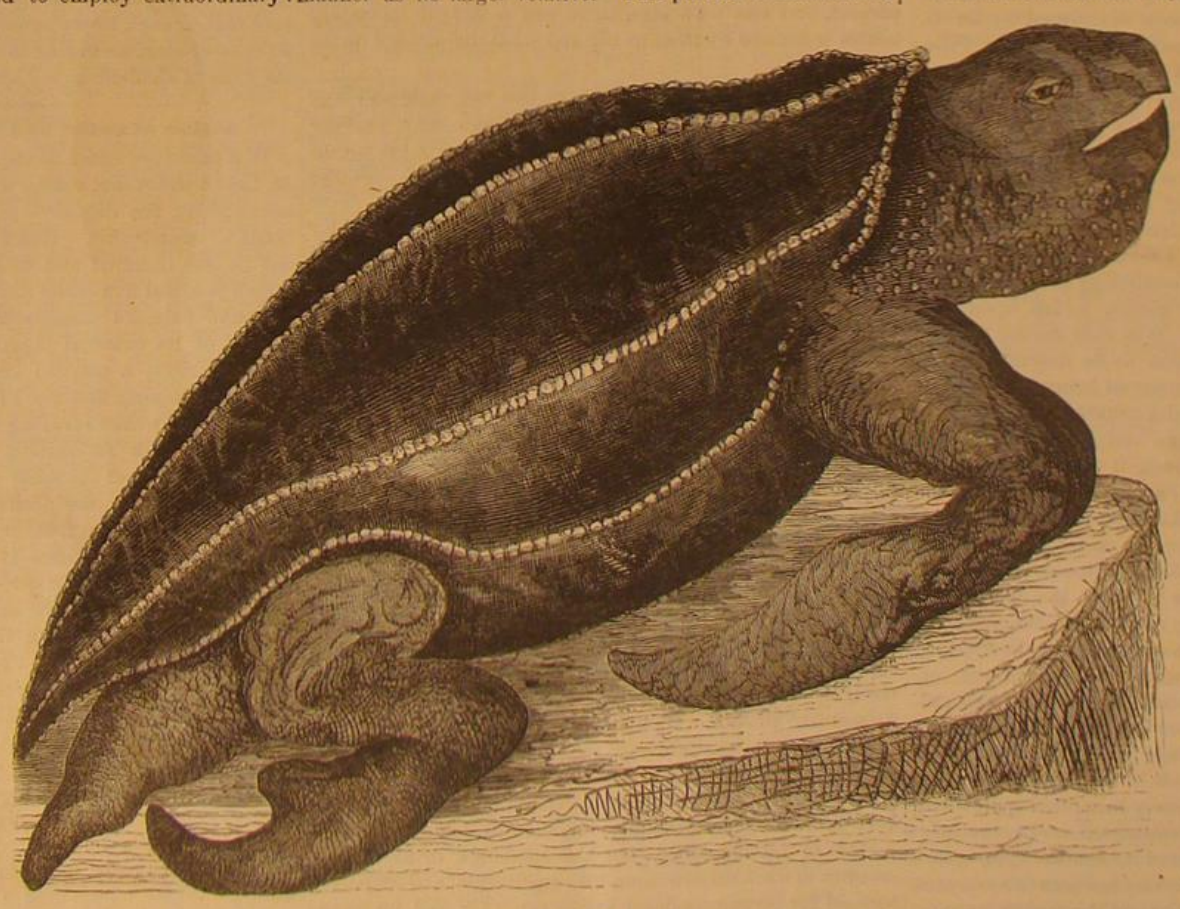
EARTH STARS.

would take it to be almost anything else than a plant, yet it is a plant, and a very interesting one, belonging to the vast class of fungi. Most persons are quite familiar with its near relatives, the puffballs, which at first are round masses of a white puffy substance, and later a globular membrane filled with blackish dust, which passes out on the slightest touch in smoke-like puffs. Each puff of this dust is made up of millions of minute spores, which serve to multiply the plant, and serve the place of seeds.

The starry puffball in its early stage would readily escape notice or be taken for a small common puffball, and, like that, is attached to the earth. Unlike the common one, our starry puffball has a thick papery or leathery outer skin, which, at the proper stage of development, bursts in a somewhat regular manner and exposes the puffball portion, the star-like envelope remaining attached. We sometimes see oranges peeled for table decoration in a manner that reminds one of the earth stars.

The outer skin bursts with such force as to throw the plant several inches away from the place where it grew; hence it is rarely that they are found attached to the earth where they grew.

The central puffball gives off clouds of spores in the same manner as its larger relative. This portion sometimes sits directly upon the center of its starry shield, as in Fig. 2, or is raised above it upon one or more short stems. The genus is named *Geaster*, which means earth star. There are eleven species in Great Britain, and only about six recorded for this country. During the hot, dry weather the earth star closes up, as shown in Fig. 2, but after a rainfall or during a heavy fall of dew the star slowly expands, and assumes the position shown in Fig. 1.



LEATHERY TURTLE.—*Sphargis coriacea*

A THREE HUNDRED DOLLAR TURTLE.

A magnificent living specimen of the so-called "leathery turtle," also "lyre turtle," and "trunk turtle," and *Sphargis coriacea* of the naturalists, was captured last week by Capt. Hines, of the fishing steamer Humphrey, while cruising for menhaden, some 125 miles off Absecom Light. When this turtle was first sighted it was fast asleep on the surface, evidently taking a sun bath.

After surrounding it with a "purse" net, a second and third net had to be used before the powerful reptile was securely entangled, so rapidly did he tear the nets asunder with his powerful fore and hind flippers. A crane was rigged on the deck of the steamer, by which means the turtle was carefully landed on the deck and brought to New York city to be sold—two amateur showmen of the market being the purchasers at $250, though Mr. Starr, of Bunnell's Museum, shortly afterward offered $300 for it. Under a canvas on the Fulton Market slip it reposes on a platform, where it is "bountifully fed on water melon rinds and butter-fish," as the showmen state.

This curious and very interesting animal is well worth seeing, as this one is the first living specimen that has been brought to New York since the one was captured off Long Island Sound, September 7, 1826. The one at the market will weigh in the neighborhood of 2,000 lb., and measures over 7 feet in length, is 43 inches broad, 3 feet thick, and the flippers are 47 inches in length, which, without doubt, ranks it as the largest living turtle ever brought to the Fulton or Washington market.

At the Berlin Fisheries Exhibition the United States Fish Commission exhibited in the collection of American turtles one of the finest specimens of the leathery turtle ever captured on our coast, and which was acknowledged to put Yankee-land ahead on the turtle question.

In color the skin or the shell of the leathery turtle is of a deep blue-black, and shining, reminding one of polished leather or black vulcanized rubber. About the throat are numerous mottlings of light blue spots. In place of the usual shield of horny plates that are to be found on all turtles, this variety is covered with innumerable small plates about the size of a ten-cent piece, which are situated under the leathery skin.

The upper shell, as will be seen by the illustration, is of a peculiar form, being composed of nine keel-like longitudinal ridges. The central and most prominent one, situated on the top of the back, is the highest. These dorsal ridges are all more or less scalloped, and are of a dirty bluish white. The front and hind flippers of this turtle are very stout and powerful and destitute of nails; in general form they are fin-like and capable of driving the animal through the water with great speed and force. The inside of the throat is lined with sharply tipped spines which point inwards, so that whatever enters has of necessity to be swallowed. The stout neck supports a large and massive head with strong and powerful jaws, the upper one being provided with notches, into which the sharp hook or beak of the lower jaw fits.

This turtle is undoubtedly an inhabitant of tropical waters, and is probably brought to our waters by the action of the Gulf Stream and other ocean currents.

The immense size and weight of this turtle would render it a prize indeed to any lone and poorly-paid fisherman who might run across a specimen once in a while, were it not that the flesh is poisonous when eaten and produces severe sickness.

The food of the leathery turtle consists of the larger and coarser varieties of marine plants, such as the gulf weed and laminarias. The shells of these turtles have often been used for small boats, as well as drinking troughs for domestic animals and bath-tubs for children.

The habit of the leathery turtle is much the same as that of the green turtle, logger-head, and hawk's-bill turtles. When sleeping or resting it floats on the surface. When feeding it is capable of remaining under water a long time before rising to the surface for a fresh supply of air.

A large specimen, which was captured in Massachusetts Bay, in 1824, when asleep and basking, was sold for $200 to the New England Museum.

The largest specimen ever exhibited in this country was one that measured over 10 feet; this was lost at the burning of Barnum's (old) Museum. This one was captured off Sandy Hook, in 1816, which, including stuffing, setting-up, etc., cost Peale, the founder of the American Museum, afterwards Barnum's, $400. The first recorded specimen taken on our coast was in 1811. From 1811 to present date, some thirty specimens have been caught, most of them having been secured by the Smithsonian Institution, so that an animal of such uncertain occurrence must be considered very rare. The leathery turtle, like all other deep-sea turtles, never visits the shore except during the breeding

season to deposit its eggs. Ancient mythology is responsible for the legend that Mercury first acquired the idea of the form of the lute or lyre from the general appearance of this turtle; the ridges along the back being suggestive of the strings, and the broad hind feet representing the foot of the instrument. The French name for this turtle is *luth* (a lute).

NATURAL HISTORY NOTES.

Interesting Case of Commensalism.—Dr. Möbius, in his recent work on the fauna of the Mauritius Islands, gives a description of two crabs of most extraordinary habits. Both belong to the family polydectinæ, the species of which have their front claws armed with large teeth. Latreille, who first named the crab *Polydectes cupulifer*, remarked that a gummy substance was always to be found at the ends of the claws of this species, and Dana described the animal as having always something spongy in its hands. Dr. Möbius has discovered the remarkable fact that these things held in the two claws of the crab are in reality living sea-anemones. These anemones are attached to the immovable joint of each claw, while the teeth of the movable joint of the claw are kept buried deep into the flesh of the sea-anemones, and thus hold them fast, although each anemone can easily be pulled away from its position with the forceps in specimens preserved in spirits. The mouth of the sea-anemone is always turned away from the crab. The same curious combination exists in the case of another species of the same family, but of a different genus, *Melia tessellata*, which also inhabits Mauritius. Professor Möbius gives the following account of the matter: "I collected about fifty male and female specimens of *Melia tessellata*; all of these held in each claw an *Actinia prehensa*. The recurved hooks of the inner margins of the claw joints of the crab are particularly well adapted to hold the actinias fast. I never succeeded in dragging the living actinias out without injuring them. If I left the fragments of them when pulled out lying in the vessel in which the *Melia* was the crab collected them again in his clutch in a short time. If I cut the actinias in pieces with the scissors I found them all again in the claws of the crab after a few hours. It is very probable that the actinias aid the crab in catching its prey by means of their thread-like cells, and that the actinias, on the other hand, gain by being carried from place to place by the crab, and are thus brought into contact with more animals which can serve as food to them than they would if stationary. This is a very interesting case of commensalism."

A Locomotive Dicotyledon.—So far as has been generally known hitherto the power of voluntary locomotion of plants from place to place is confined to members of the lower orders of cryptogams, namely, algæ and fungi; but an interesting case of voluntary motion among dicotyledonous plants, in a species of *Loranthus*, has been discovered by Dr. G. Watt, of the Educational Department, Bengal Lower Provinces. It is only while the seed is germinating that the motion takes place, but the mode of traveling is very peculiar and quite different from that of any other known plant. The plant is a native of Bengal, and like all other members of the genus is parasitical, growing upon a few evergreen trees, particularly upon some species of *Memecylon*. The fruit, like that of its relative, the mistletoe, and nearly all other members of the order, consists of a mass of very viscid pulp surrounding a single seed, and on separating from the parent plant adheres to whatever it may chance to fall upon, and after a time begins to germinate. It is only during the first stage of germination that the motion to be described takes place, and it is evident that the power of being able to move about is to enable the plant to find a suitable place to grow upon. The radicle at first grows out, and when it has attained a length of about an inch it develops upon its extremity a flattened disk, and then curves about until the disk is applied to any object that is near at hand. If the spot upon which the disk fastens is suitable for further development of the plant, germination continues, and no locomotion takes place; but if, on the contrary, the spot should not be favorable, the germinating embryo has the power of changing its position. This is accomplished by the adhesive radicle raising the seed and advancing it to another spot; or, to make the process plainer, the disk at the end of the radicle adheres very tightly to whatever it is applied; the radicle itself straightens and tears the viscid berry away from whatever it has adhered to, and raises it in the air. The radicle then again curves and carries the berry to another spot, where it again adheres. The disk then releases itself, and by the curving about of the radicle is advanced to another spot, where it again fixes itself. Dr. Watt says he has seen this repeated several times, so that to a certain extent the young embryo, still within the seed, moves about. It seems to select certain places in preference to others, particularly the leaves, which in the *Memecylon* are evergreen and very dense. The berries on falling are almost certain to alight on the leaves, and, although many germinate thereon, they have been frequently observed to move off the leaves on to the stems, and finally fasten there.

The Origin of the Cat.—St. George Mivart, in his recent work on the cat, says that the early history of the domestic cat is uncertain. It is not the common cat of zoology which is the wild or native cat, an animal that existed abundantly in the forests in the time of Julius Cæsar and was seen in Wales within the last twenty years. It appears to have come down to us from the Eyptians, being mentioned, Mr. Mivart informs us, in inscriptions as early as 1684 B.C., and being, as well known, an object of religious worship and the venerated inmate of certain temples. It was an emblem of the sun to the Egyptians, and, according to Herodotus, the death of a cat from natural causes was followed by the ceremony of shaving the eyebrows in token of mourning. From Egypt it must have been introduced into Greece, though Professor Rolleston, in his article on cats in Humphry and Turner's *Journal of Anatomy*, considers that the cat of the ancients was the *Mustela foina*, the "beech" or "stone" marten. It was not a domestic animal among the Hebrews, though it was known to them, as we read in the apocryphal book of Baruch, who lived, it is supposed, in the reign of Jeholakim, about 600 B.C., that "upon their bodies and heads sit bats, swallows, and birds, and the *cats* also." In regard to the pedigree of the cat, Mr. Mivart traces it from unknown insectivora-like animals, which produced, among other forms, *Arctocyon*. From this, as a root, the carnivorous branch divided into cynoid and arctoid branches—the former developing into the typical *Canidæ*; the latter, after giving off other branches, leading to the *Ursidæ*, and, through *Procyurus*, to the *Viverridæ*, *Hyænidæ*, *Cryptoproctidæ*, and *Felidæ*.

Dr. Andrew Clark on Alcohol.

Dr. Andrew Clark lately delivered an evening address on alcohol, in the Great Portland Street School-rooms, London, to a crowded and deeply interested audience. He said he purposed offering a few informal remarks upon the influence of alcoholic drinks upon health, upon work, upon disease, and upon the succeeding generation. This question of alcohol was of the first importance to us as a nation and as individuals, and hence a great responsibility rested upon those who professed to speak upon it with authority. He ventured to say that he knew something about this question. For twenty-five years he had been physician to one of the largest hospitals in this country (the London Hospital), and there, as elsewhere, it had been a part of his business in life to ascertain the influence which alcoholic drinks exercised upon health, and he had with deep interest and attention striven to get at the truth of the matter. In the first place let him distinctly say that alcohol was a poison, as were also strychnine, arsenic, and opium; but in certain small doses strychnine, arsenic, and opium were useful in special circumstances, and in very minute doses alcohol could also be used without any obvious prejudicial effect upon health. He was not going to discuss what these minute doses were, save to say that they were very minute. A perfect state of health (and it was rarely to be found) could not be benefited by alcohol in any degree, and in nine times out of ten it was injured by it. He said this not as a total abstainer, though he earnestly hoped that all the rising generation would be. Instead of the ideal state of health which might be enjoyed save for the nature of our surroundings, the sins of our parents, and our own sins, there was a sort of secondary health possessed by most of us, and what did alcohol do for this?

He had two answers to give—that this sort of health bore apparently with alcohol better than the other, and sometimes seemed as if benefited by it; and this was exactly the sort of health that formed the great debating ground of different people with respect to the use of alcohol. Secondly, there were some nervous people always ailing, yet never ill, for whom he had a profound sympathy, who seemed to derive great comfort from alcohol, and to these he had sometimes said, "Take a little beer or wine, but take great care never to go beyond the minute dose." He did not defend this, but simply stated it to show what he thought. As to the influence of alcohol upon work, Dr. Clark went on to encourage his hearers to try the experiment of total abstinence, and observe the result in regard to work. Let them, however, try it fairly, and not allow themselves to be deterred from it by the evil prognostications of friends. He was certain that if this experiment were tried each individual present would come to the conclusion that alcohol was not a helper of work, but, on the contrary, a hinderer.

Now as to the effect of alcohol upon disease. He went through the wards of his hospital to-day and asked himself how many cases there were due to natural and unavoidable causes and how many to drink, and he came, after careful thought, to the conclusion that seven out of ten owed their ill-health to alcohol. He did not say that these were excessive drinkers or drunkards—in fact, it was not the drunkards who suffered most from alcohol, but the moderate drinkers who exceeded the physiological quantity. The drunkard very often was an abstainer for months together after a period of intemperance, but the moderate drinker went steadily to work undermining his constitution, and preparing himself for premature decay and death. He had no means of finding out how many victims alcohol claimed each year, but certainly more than three-fourths of the disorders of fashionable life arose from the drug of which he was speaking. Finally, Dr. Clark dwelt upon the heredity of the alcoholic taint, and closed by saying that sometimes when he thought of all this conglomeration of evils he was disposed to rush to the opposite extreme—to give up his profession, to give up everything, and to enter upon a holy crusade, preaching to all men everywhere to beware of this enemy of the race.

Pulque.

BY E. E. HOPEL, M.D.

Pulque is the national drink of the Mexicans. It is produced by the fermentation of the maguey or *Agave americana*. This plant has been considered diuretic and antisyphilitic. There is no authentic record as to who first made pulque or neutli. Many are the traditions extant among the Mexicans concerning its first manufacturer. It seems, however, to be the more general belief that it was Xochitl, daughter of a nobleman called Papantezin, who lived in the time of Tapancaltzin, eighth king of the Toltecs. From time immemorial pulque has been considered to contain medicinal virtues in a very high degree as well as all the other products of the maguey, and at one time the maguey was even said to hold a spiritual life and was held in reverence. To-day pulque is esteemed by the ignorant classes as having a variety of curative powers, and physicians use it for its alcoholic and nutritive properties. It is held as a stimulant, tonic, and antispasmodic. They recommend it to the infirm, weak, anæmic, and nursing mothers.

ITS COMPOSITION.

It is obtained by fermenting the juice expressed from the central portion of the maguey plant. After expressing the juice between rollers, or, as was formerly done by means of suction, it is carried to the vats for fermentation. These vats consist of raw ox-hides loosely suspended in a strong wooden frame, with the hair on the outside. These hide-made vessels contain the cryptococcus or ferment, which is a residuum of the former fermentations. After a few hours fermentation is fully established and the pulque is drawn off, always leaving a residuum in the vessel for the next fermentation. The liquid obtained from the maguey plant has a density varying from 1·029 to 1·042, and contains in 100 parts 9·553 of sugar, 0·540 of gum and soluble albumen, 0·726 salts, and 89·181 of water, holding in solution resinous matter, fats, albuminoids, starch, dextrine, and glucose.

According to Don Jose Ramos, its salts contain potash, soda, and lime in moderate proportions, and magnesia and alumina as chlorides, carbonates, sulphates, and silicates; hence the great value in which it must have been held in former times and in which it ought to be held at the present day.

From the composition of the juice of the maguey one may have an idea of the therapeutic effects of the pulque, allowing for the change which these constituents may undergo through fermentation. Pulque has no definite proportion of alcohol, for one may readily see from the way it is manufactured that it cannot have any definite standard. It, however, contains a very small proportion of fusel oil and carbonic acid in large quantities. Considering that its manufacture is not based upon any standard of purity, or even with ordinary care, its density cannot be given with any certainty, though it varies from 0·9943 to 1·0200 ("La Esquela de Medicina"). To-day it is attracting the attention of the medical fraternity because of the evil effects upon the liver caused by its excessive use among the lower classes, not, however, in the light of pulque as a compound, but because of the evil effects of the alcohol which it contains. It is, therefore, proposed to adopt some other form of manufacture that a much lower percentage of alcohol may enter into its composition, according to a fixed standard, and thus avoid the evils of alcoholism.—*Therapeutic Gazette.*

Action of Coffee and Sugar on the Stomach.

In a paper presented to the Société de Biologie (*Rev. Méd.*) M. Leven states that coffee, so far, as is often supposed, from accelerating the digestive process of the stomach, rather tends to impede this. When thirty grammes of coffee, diluted in one hundred and fifty of water, is given to a dog, which is killed five hours and a half afterward, the stomach is found pale, its mucous surface being anæmic, and the vessels of its external membrane contracted. The whole organ exhibits a marked appearance of anæmia. Coffee thus determining anæmia of the mucous membrane, preventing rather than favoring vascular congestion, and opposing rather than facilitating the secretion of gastric juice, how comes it that the sense of comfort is procured for so many people who are accustomed to take coffee after a meal? A repast, in fact, produces, in those whose digestion is torpid, a heaviness of the intellectual faculties and embarrassment of the power of thinking; and these effects, and the disturbance of the head, are promptly dissipated by the stimulant effect which the coffee produces on the nervous centers, as shown by experiments with casein. Coffee and tea, when taken in excess, are a frequent cause of dyspepsia, for the anæmic condition of the mucous membrane being periodically renewed, a permanent state of congestion is at last produced, which constitutes dyspepsia. Sugar, which with many doctors has a bad reputation, is an excellent aliment which assists digestion, and should not be proscribed in dyspepsia. By experiment, digestion of meat is found to take place much more completely when sugar is added. Coffee exerts both a local and general action, operating locally by means of its tannin, by diminishing the caliber of the vessels, but acting on the general economy by exciting the nervous centers and the muscular system. It renders digestion slower, and is only of good effect by relieving the feeling of torpor after meals. Its injurious action on digestion may be corrected by adding sugar so as to counterbalance its effects on the mucous membrane. This adding sugar to coffee is not only a pleasant practice, but one contributing to digestion.

Nitro-Benzol in Oil of Bitter Almonds.

The oil is mixed with a little alcohol, a solution of pure potash, and a few drops of ferric chloride. The mixture is allowed to stand for some hours, shaken, and distilled, avoiding with great care bumping or spirting, and the direct action of the flame upon any part of the oil. A portion of the distillate, dehydrated, is heated in a test tube with a few fragments of pure potash. If the oil was pure the mixture

remains colorless. If nitro-benzol was present there is produced a dark coloration from the formation of azo-oxybenzol, and as a little aniline is also formed, a few drops of solution of chloride of lime added to the cold mixture produce a violet coloration.—*Enrica Pegna, in Zeitschrift für Analytische Chemie.*

Asphalt.

A lecture on "asphalt" was lately read by Mr. E. B. Bell, C.E., before the members of the Balloon Society, London. The material was, it was shown, a natural production, consisting of from 5 to 15 per cent by weight of pure bitumen combined by carbonate of lime. Although its composition was well known, and the components could be derived in abundance, and at moderate cost, asphalt had not yet been artificially produced with success, either chemically or commercially. Its employment was of the highest antiquity, it having been well known to the Egyptians, Assyrians, and Babylonians, although, curiously enough, no allusion to it was made by Roman or Greek writers, nor could it be found in the works of those classic nations. It appears to have been rediscovered by Dr. D'Eyrinis, who published a work in 1721, enthusiastically advocating its use, not only as a cementitious material, but as a universal panacea in medicine. Dr. D'Eyrinis found out the material while making a geological excursion in the year 1718, in the Val de Travers, canton of Neufchatel, Switzerland, and for nearly a century this was the only mine worked.

In 1838 the first footpaths were made of the material at Paris, and the Seyssel mines were opened; but owing to commercial speculations, asphalt lost favor, and it was not till 1854 that the first Parisian carriageway, that of the Rue Bergère, was paved with it. Since 1871 a very large proportion of the streets of Paris, both the carriage and footways, had been laid with asphalt. The first experiment in London was in May, 1869, when 485 square yards of Threadneedle street were laid with it, and its use had been largely extending. The material was at first used as mastic, boiled on the spot in large caldrons, but latterly it had been found better to use it as a powder, rammed by manual pressure. The present treatment was that the rock was brought to England and stored in the open. It was thrown into a stone crushing machine, and having been reduced to pieces about the size of a walnut, the material fell on to a shute, from the bottom of which an endless chain of buckets carried the material to the hopper of a Carr's disintegrator, in which it was reduced to powder. It was then heated in cylinders over a coal fire.

Each charge consisted of about 2½ tons, and took from two to three hours to attain the requisite temperature, and varied according to the amount of vapor to be driven off, and had to be very delicately regulated. If the material was not sufficiently heated, it would not adhere enough under compression to give the laid surface a hard face. If, on the other hand, it was overheated, the bitumen was fused, and little but comparatively worthless limestone left; as a rule, the heat varied from 220° to 250° Fah., but much was left to the experience of the skilled calciner. The powder was now ready for laying, and owing to its dense, compact nature it would retain the heat for many hours. A concrete foundation having been laid and allowed to set firmly, the asphaltic powder was brought to the street in open carts and spread transversely across the carriageway in widths of from 3 feet to 4 feet, in a thickness about two-fifths above the specified compressed section. It should still have a minimum temperature of 115° Fah. It having been raked with as much regularity as possible over the concrete, the powder was rammed all over with heavy iron, mushroom-headed punners, heated in portable furnaces to a temperature that prevented adhesion. This ramming was the crucial point of the operation, and was at first done very lightly, the pressure being augmented as the material attained solidity. An opening presented itself to mechanicians to devise some mode of mechanical ramming; many plans had been suggested, but at present none had answered. The objection to rollers was that they drove the powder forward in a wave, and the force was not advantageously applied; a steam hammer executed the work better, but the practical difficulty of laying the temporary rails had been fatal to the method. After the surface was compressed by the punners, the surface was seared with a smooth iron, and it was gauged by a long straight-edge, beaten to a uniform level, and the roadway was finally thrown open for traffic as soon as it had cooled to the temperature of the atmosphere.

The lecturer then indicated the advantages of the asphalt as a paving material from the sanitary, mercantile, ratepayers', and humanitarian points of view. He thought all would agree that that material was best for roadways which created least dust and mud, presented the most continuous surface, and retained least damp. Dust in itself, apart from its impure character, was injurious to health, and was rendered worse by the deleterious substances contained in it. Asphalt stood foremost, he held, in its imperviousness to filth and moisture, and hence no exhalations could pass through it from the ground below, nor did it suffer any change under moisture. It was also almost noiseless, and although exceeded in this respect by wood, asphalt had not the peculiar rumbling sound which that material caused. To the mercantile portion of the community it was not only commended by its freedom from dust and mud, but from the absence of vibration, and the minimizing of tractile force needed to draw given loads. The unpopularity of asphalt with many engineers and architects arose from the fact that streets were laid with preparations of gas tar, or pitch and limestone, or clay, which resulted in a soft surface during the first year or two, giving off oils by evaporation, and breaking up after two or three years' wear. The cost of cleansing and watering was greatly reduced by the use of true asphalt. Comparisons made by Lieutenant-Colonel Haywood, the City Engineer, showed that one cartload of refuse was swept from every 344 square yards of macadam, from every 500 square yards of granite, from 1,666 square yards of wood, whereas 4,000 square yards of asphalt had to be traversed before a load was obtained. The expense and inconvenience of renewal was also reduced. One of the greatest conveniences for a crowded city was the fact that an asphalt roadway once down, the street need never be blocked for repairs. Cheapside had now been laid for eleven years, and the traffic had never been interrupted for an hour during mending. The watering, again, was reduced to the flushing of the channels with streams of water.

The common objection to asphalt was that it afforded a bad foot-hold to horses. In itself, however, whether dry or quite wet, it was not slippery, but when the air was humid and after slight dirt upon the surface rendered it greasy. Lieutenant-Colonel Haywood had proved by statistics that fewer horses fell on asphalt than on granite, and this was confirmed by much independent evidence. Further than this, horses hurt themselves the less by a fall on asphalt than on granite. It was chiefly on the transition from one material to another that accidents occurred, and the true remedy appeared to be to lay all with the same class of paving. In conclusion, the author showed that among the other uses of material were in flooring warehouses and granaries, for which its imperviousness to damp and vermin strongly recommended it.

Sunken Floors.

So few of the floors constructed in new houses are, says the *Building News*, equal to their work, that the attention of architects and builders might be profitably called to the subject. In going over some of the newly-erected houses in the suburbs of London, it is not infrequent that one finds dwelling house floors which have sunken so much in the center as to destroy the comfortable assurance that they are safe. These instances occur chiefly in houses erected by speculative builders, who seem to be under no regulation of any kind in respect of floor timbers. We have noticed serious deflection in the floors of a house rented at over £100 per annum, the consequences of which are cracked ceilings below, opening crevices between skirting and floor, and an uneven surface which makes every table shaky, and prevents large pieces of furniture like sideboards and bookcases being placed against the walls without a considerable propping underneath their front supports. Numerous books on the strength of materials have appeared, but the builder seems to regard such knowledge as merely theoretical, and is generally guided by the sizes of other timbering which he has found to answer. He does not always seem to understand the well established theorem that the strength of two pieces of timber of equal length not always in proportion to the area of cross section.

Many practical builders have a conviction that if a timber as a joist has a larger cross section than another it must be stronger. Thus they fancy a piece of timber 8 inches by 3 inches, which equals 24 square inches in sectional area, cannot be so strong as a piece 5 inches by 6 inches which has 30 inches in area. The fact is, the smaller piece is the strongest of the two if both are placed upon edge, as every one knows who has studied the principles on which the strength of beams depends. It is easy to convince the most practical of this seemingly inexplicable fact. If two beams of like size are placed side by side, the two will resist twice the amount of one of the pieces. This is so self-evident that experiment is not needed to establish the fact; in the same way, three beams will resist three times as much as one, and so on of any number. In plain English, when lengths and depths are equal, a beam of 6 inches in breadth will bear three times as much as one of 2 inches in breadth. It may be shown by experiment quite as readily that the strength increases more rapidly with the depth. In point of fact, another law of proportion is observed—namely, that having two beams of the same breadth and length, but of different depth, the strength increases more rapidly than the depth; thus it is found a beam 9 inches deep bears more than three times as much as one only 3 inches deep. These are very simple statements derived from facts and experiments, and no complex conception of the resistance of certain fibers on both sides of a neutral axis, or equations in algebra, are required to establish them.

In dwellings the load on a floor is chiefly made up of furniture, though this is generally placed, at least the heavier articles, round the walls of rooms. The space occupied by tables and other objects in the center of a room reduces the available standing area, and thus, for all ordinary floors, 70 pounds per superficial foot may be calculated for as the full load in extreme cases. Rules founded upon the resistance of beams to rupture are, however, of little use, as the floors may be seriously affected by deflection, and deflection is directly as the cube of the length. In regarding stiffness, the load per foot has been given by one authority as 90 pounds per foot, including weight of materials; and the rule involving several dimensions is expressed in the formula—

$$c\,l^3 = i\,b\,d^3,$$

from which, by inversion, the distance from centers, the length, the breadth, and the depth of beams, may be found. Thus the first of these will be generally found the most convenient in practice; which may be expressed by—

$$c = \frac{i\,b\,d^3}{l^3},$$

in which c denotes distance apart from centers of beams; l, the length of beam, both in feet; i, a coefficient for the wood used; and b and d, the breadth and depth. It makes all the difference to place joists an inch nearer, though builders like to give as much interval as they can, for economy's sake. Instead of joists being placed 12 inches apart, it is oftener to find them 13 inches or even 14 inches, and the consequence is a scantling which has been found to answer in a well-built house fails when it is introduced with a greater distance or interval. Then, the modern speculative builder's floor is seldom properly stiffened by cross bridging; there is only one row, instead of two or more. Of course no practical man will deny the advantage of bridging his floor joists; it helps wonderfully to prevent deflection under a concentrated load, for the joist immediately beneath the load is relieved of direct strain, and the joists on each side take a share of the weight. Generally it may be taken that a properly bridged floor is capable of sustaining, without mere deflection, twice as much load as the same floor without bridging, so that the cost of the introduction is amply repaid. It is a misfortune the Building Act does not deal with floors as it does with walls, by laying down certain scantlings for the guidance of builders, as a weak deflecting floor in course of time tends to render the house unstable, by acting injuriously upon the walls. Builders might be willing to follow regulation scantlings for their joists and rafters who could not be induced to calculate for themselves, who would scorn the idea of studying moments of resistance, or who would never be able to work out a formula.

Railway Progress in 1880.

Advance sheets of "Poor's Railway Manual" for the current year show that there were added to the mileage of railways in operation last year 7,174 miles, raising the aggregate from 84,225 miles, reported to the Manual, to 93,671 miles. The *Railroad Gazette's* figures make the number of miles of road in operation at the beginning of 1880 greater by 2,272 miles than the Manual states, while the estimate for 1881 is accounted substantially correct.

The Manual's statistics of roads and equipment for the past year show as follows:

	1880.	Increase.	Per Cent.
Miles of road, total	93,671	7,174	8·3
Miles of road reporting	84,225 (Dec.)	490	0·6
Miles of second tracks and sidings	21,978	1,937	9·7
Miles of steel track	33,680	...	...
Number of locomotives	17,949	865	5·1
Number of passenger cars	12,789	780	6·5
Number of baggage, mail, and express cars	4,786	267	6·0
Number of freight cars	539,355	59,165	12·3

By decades the progress of railroad building in this country since 1830, when there were but 23 miles in operation, is summed up as follows:

From 1830 to 1840	2,785 miles.
" 1840 " 1850	6,213 "
" 1850 " 1860	21,614 "
" 1860 " 1870	22,279 "
" 1870 " 1880	40,757 "

The capital, gross earnings, expenses, and net earnings per mile of road, and percentage of net earnings on capital of the railroads of the United States, for ten successive years, have been:

Year.	Stock and Debt.	Gross Earnings.	Expenses	Per Ct. of Ex. to Earn.	Per Ct. of Earn. on Capital.
1871	$59,726	$9,040	$5,863	64·8	5·32
1872	55,116	8,116	5,224	64·4	5·25
1873	57,136	7,947	5,172	65·1	4·86
1874	60,944	7,513	4,776	63·6	4·49
1875	61,533	7,010	4,425	63·1	4·20
1876	60,791	6,764	4,228	62·5	4·16
1877	61,650	6,382	4,075	63·8	3·74
1878	59,040	6,232	3,847	61·7	3·04
1879	58,070	6,244	3,670	58·8	4·49
1880	60,650	7,307	4,277	58·5	5·00

Capital per mile has varied but little since 1874, at the close of the railroad construction period. Gross earnings per mile decreased continuously from 1871 down to 1878, made very little gain fromt the lowest point in 1879, but in 1880 leaped up at once, becoming the largest for six years. Expenses made a similar leap, yet not so far but that net earnings per mile were the largest since 1871. So the percentage on the capital formed by the net earnings decreased continuously from 1871 to 1877, and since 1877 has increased, and most of all last year, when it became just 5 per cent, which is as good an average as most European countries exhibit; this has been exceeded only in 1871 and 1879.

Fertility of Volcanic Soils.

The rapid and exceptional fertility in volcanic soils, such as those about Mount Etna, has been attributed to a superabundance of phosphoric acid. M. de Gasparin, however, is led to reject this view. An exuberantly fertile garden between Catania and Nicolosi contains, he finds, only two-thousandths of phosphoric acid; fertile land at Nimes and Caen has hardly more than one-thousandth. Other cases are given. The rapid production of the land about Etna he considers to be due mainly to the continuance of muddy formations and the climate, which hastens the decomposition of lava, so that the supply of organic materials is presented or formed with exceptional promptitude.

DECISIONS OF THE COURTS RELATING TO PATENTS.

Supreme Court of the United States.

WEBBER *vs.* VIRGINIA.

1. TAXATION — LICENSE — SALE OF MANUFACTURES — PATENT.—A State may require the taking out of a license for the sale of a manufactured article, and the fact that the article is produced under a patent will not defeat this power.

2. COMMERCE—TAXATION AGAINST NON-RESIDENT MANUFACTURER.—A tax upon the manufacturers of another State, while those of the State itself are free from such taxation, is invalid, since it discriminates against the rights of the non-resident manufacturer, and violates the constitutional provision vesting all commercial control in the Federal Government.

In error to the Supreme Court of Appeals of the State of Virginia.

In May, 1880, the plaintiff in error, J. T. Webber, was indicted in the County Court of Henrico County, in that State, for unlawful selling and offering for sale in that county to its citizens certain machines known as "Singer sewing machines," which were manufactured out of the State, without having first obtained a license for that purpose from the authorities of the county or having paid the tax imposed by law for that privilege. The indictment was founded upon the forty-fifth and forty-sixth sections of the revenue law of the State, which are as follows:

45. Any person who shall sell or offer for sale the manufactured articles or machines of other States or Territories, unless he be the owner thereof and taxed as a merchant, or take orders therefor on commission or otherwise, shall be deemed to be an agent for the sale of manufactured articles of other States and Territories, and shall not act as such without taking out a license therefor. No such person shall, under his license as such, sell or offer to sell, such articles through the agency of another, but a separate license shall be required from any agent or employe who may sell or offer to sell such articles for another. For any violation of this section the person offending shall pay a fine of not less than fifty dollars nor more than one hundred dollars for each offense.

46. The specific license tax upon an agent for the sale of any manufactured article or machine of other States or Territories shall be twenty-five dollars, and this tax shall give to any party licensed under this section the right to sell the same within the county or corporation in which he shall take out his license; and if he shall sell or offer to sell the same in any other of the counties or corporations of this State he shall pay an additional tax of ten dollars in each of the counties or corporations where he may sell or offer to sell the same. All persons, other than resident manufacturers or their agents selling articles manufactured in this State, shall pay the specific license tax imposed by this section. (Acts of Assembly, 1875 and 1876, p. 184, chap. 162, secs. 45, 46.)

To the indictment the accused pleaded "not guilty;" and on the trial it was proved that he had sold and offered to sell sewing machines in Henrico County, as charged, but that at the time he was acting as an agent or employe of the Singer Manufacturing Company, a corporation created under the laws of New Jersey; that this company had a place of business in Richmond, Virginia, where it was licensed as a resident merchant for the year beginning May 1, 1880, and had paid the required license tax and where it kept a stock of machines for sale; that the machines sold by the accused were the property of the company, and were manufactured by it out of the State and in accordance with specifications of a patent of the United States granted in 1879 to one W. C. Hicks, and by him transferred to the company. It also appeared that the accused had not taken out a license to sell the machines in Henrico County, and was not himself taxed as a merchant, and had not taken orders for the machines on commission or otherwise. On the trial his counsel requested the court to instruct the jury that if they believed the Singer Manufacturing Company had paid for a general merchant's license for the year beginning May 1, 1880, and received such license, or that the machines sold were constructed according to the specifications of the patent held by the company, and that the accused was acting in the sales made only as its employe, he was entitled to a verdict of acquittal. The court refused to give these instructions, and, at the request of the attorney for the Commonwealth, instructed the jury, in substance, that if they believed the accused had, at different times within the year previous to the indictment, sold or offered to sell in Henrico County to its citizens Singer sewing machines manufactured beyond the State, and at the time he was neither the manufacturer himself nor the owner of them, and was not taxed as a merchant in the county, and had not taken orders therefor on commission or otherwise, and had not obtained a license to sell the same in the county, and had not paid to the proper officer the tax imposed by law for selling the same in that county, they should find him guilty. The jury found the accused guilty, and he was sentenced to pay a fine of fifty dollars, besides costs. On appeal to the Circuit Court of the county this judgment was affirmed, and on further appeal to the Supreme Court of Appeals of the State the judgment of the Circuit Court was affirmed. To review the latter judgment the case is brought here on writ of error.

Field, J.:

In the County Court, where the accused was tried, the only defense presented by his instructions was that he was acting as the agent of the Singer Manufacturing Company, which had a license from the State as a resident merchant in Richmond to sell the machines, and also held a patent of the United States authorizing it to manufacture and sell them anywhere in the United States. To this defense the answer is obvious. The license being limited to the city of Richmond gave no authority to the company to sell the machines elsewhere, and of course gave none to its agent. Besides the question as to the extent of the territorial operation of the license depended upon the construction given by the Court of Appeals of the State to the statute, and its decision thereon is not open to review by us; and the right conferred by the patent laws of the United States to inventors to sell their inventions and discoveries does not take the tangible property, in which the invention or discovery may be exhibited or carried into effect, from the operation of the tax and license laws of the State. The combination of different materials so as to produce a new and valuable product or result, or to produce a well-known product or result more rapidly or better than before, which constitutes the invention or discovery, cannot be forbidden by the State, nor can the sale of the article or machine produced be restricted except as the production and sale of other articles for the manufacture of which no invention or discovery is patented or claimed may be forbidden or restricted.

The patent for a dynamite powder does not prevent the State from prescribing the conditions of its manufacture, storage, and sale, so as to protect the community from the danger of explosion. A patent for the manufacture and sale of a deadly poison does not lessen the right of the State to control its handling and use. The legislation respecting the articles which the State may adopt after the patents have expired it may equally adopt during their continuance. It is only the right to the invention or discovery—the incorporeal right—which the State cannot interfere with. Congress never intended that the patent laws should displace the police powers of the States, meaning by that term those powers by which the health, good order, peace, and general welfare of the community are promoted. Whatever rights are secured to inventors must be enjoyed in subordination to this general authority of the State over all property within its limits. These views find support in the language of this court in *Patterson vs. Kentucky* (97 U. S., 501; 7 Reporter, 353). In accordance with the views there expressed we can find no objection to the legislation of Virginia in requiring a license for the sale of the sewing machines by reason of the grant of letters patent for the invention. There is, however, an objection to its legislation arising from its discriminating provisions against non-resident merchants and their agents, and this is presented by the instructions given to the jury at the request of the attorney of the Commonwealth. The forty-fifth section of the revenue law declares "that any person who shall sell or offer for sale the manufactured articles or machines of other States or Territories, unless he be the owner thereof and taxed as a merchant, or take orders therefor, on commission or otherwise, shall be deemed to be an agent" for the sale of those articles, and shall not act as such without taking out a license therefor. A violation of this provision subjects the offender to a fine of not less than fifty dollars nor more than one hundred dollars for each offense. The forty-sixth section fixes the license tax of the agent for the sale of such articles at twenty-five dollars. The license only gives him a right to sell in the county or corporation for which it is issued. If he sells or offers to sell in other counties or corporations he must pay in each an additional tax of ten dollars. The section then declares that—

"All persons other than resident manufacturers or their agents selling articles manufactured in the State shall pay the specific license tax imposed by this section."

By these sections, read together, we have this result: The agent for the sale of articles manufactured in other States must first obtain a license to sell, for which he is required to pay a specific tax for each county in which he sells or offers to sell them, while the agent for the sale of articles manufactured in the State, if acting for the manufacturer, is not required to obtain a license or pay any license tax. Here there is a clear discrimination in favor of home manufacturers and against the manufacturers of other States. Sales by manufacturers are chiefly effected through agents. A tax upon their agents when thus engaged is therefore a tax upon them, and if this is made to depend upon the foreign character of the articles—that is, upon their having been manufactured without the State—it is to that extent a regulation of commerce in the articles between the States. It matters not whether the tax be laid directly upon the articles sold or in the form of license for their sale. If by reason of their foreign character the State can impose a tax upon them or upon the person through whom the sales are effected, the amount of the tax will be a matter resting in her discretion. She may place the tax at so high a figure as to exclude the introduction of the foreign article and prevent competition with the home product.

It was against legislation of this discriminating kind that the framers of the Constitution intended to guard when they vested in Congress the power to regulate commerce among the several States. In *Welton vs. Missouri* we expressed at length our views on the subject, and to our opinion we may refer for their statement. No one questions the general power of the State to require licenses for the various pursuits and occupations conducted within her limits and to fix their amount as she may choose, and no one on this bench—certainly not the writer of this opinion—would wish to limit or qualify it in any respect, except when its exercise may impinge upon the just authority of the Federal Government under the Constitution or the limitations prescribed by that instrument; but where a power is vested exclusively in that Government, and its exercise is essential to the perfect freedom of commercial intercourse between the several States, any interfering action by them must give way. This was stipulated in the indissoluble covenant by which we became one people.

In a recent case we had occasion to consider at some length the extent of the commercial power vested in Congress, and how far it is to be deemed exclusive of State authority. Referring to the great variety of subjects upon which Congress under that power can act, we said that—

"Some of them are national in their character and admit and require uniformity of regulation, affecting alike all the States. Others are local or are mere aids to commerce, and can only be properly regulated by provisions adapted to their special circumstances and localities. Of the former class may be mentioned all that portion of commerce with foreign countries or between the States which consists in the transportation, purchase, sale, and exchange of commodities.

Here there can, of necessity, be only one system or plan of regulations, and that Congress alone can prescribe. Its non-action in such cases with respect to any particular commodity or mode of transportation is a declaration of its purpose that the commerce in that commodity or by that means of transportation shall be free. There would otherwise be no security against conflicting regulations of different States, each discriminating in favor of its own products and citizens and against the products and citizens of other States."—(*County of Mobile vs. Kimball*, 102 U. S.)

Commerce among the States in any commodity can only be free when the commodity is exempted from all discriminating regulations and burdens imposed by local authority by reason of its foreign growth or manufacture.

Reversed and remanded.

A Large Electro-Magnet.

MM. Von Feilitzsch and W. Holtz have recently made, for the University of Greifswalde, an electro-magnet of enormous dimensions. The price of a bar of iron made in one single piece would have been too expensive, while, on the other hand, in a system formed of several pieces poles become developed at the contacts. The electro-magnet was, therefore, constructed of 28 plates of iron, 7 millimeters thick, bent into a horseshoe shape, and of a size such that their combination forms a cylinder 195 millimeters in diameter. These plates are varnished, in order to avoid the formation of extra currents; they are connected together by iron bands, and so arranged as to form a cylinder of uniform diameter. The total height is 125 centimeters, the distance between the poles 596 millimeters; the total weight 628 kilogrammes. The magnetizing helix is composed of 100 kilogrammes of plates of copper, forming 15 layers, insulated from one another by gutta percha.

Outside there are 175 kilogrammes of wire, 2 millimeters thick, forming 5 double layers of wire, and the extremities of the different parts of the circuit communicate with terminals fixed on insulated columns, which allow of any required connections being made. The poles are topped with two plates, 33 millimeters thick, which can be set at any required distance apart, and are capable of carrying various accessories. A movable plate, placed between the two branches, can be placed at any convenient height for the experiments. With this apparatus, excited by 50 small Grove cells, it was possible to melt in two minutes 40 grammes of Wood's metal by Foucault's experiment, and if the poles were set close, the resistance stopped the movement in spite of the tension of the driving band. It is very easy to show the rotation of the plane of polarization in heavy glass, when the latter is traversed by a ray of light, etc. In this apparatus, as has been pointed out, the bar of iron weighs 628 kilogrammes, and the wire 275 kilogrammes, while in the one constructed by Plücker, and which was the largest existing, the weights were only 84 and 35 kilogrammes respectively.—*Les Mondes.*

A Mountain Steamer.

Steam navigation among the mountain ranges of Colorado is one of the peculiarities of that wonderful region. A Denver paper says: "A sail over the placid and translucent waters of Twin Lakes will convince the traveler that Colorado affords some of the most beautiful aquatic scenery in nature. Twin Lakes are located three miles from Twin Lake station, Denver and South Park Division U. P. Railway, or 157 miles southwest of Denver, at the eastern base of the Sawache Range, at an elevation of 9,333 feet above the level of the sea. The lower lake covers 1,525 and the upper 475 acres, and they are united by a small, swift, clear stream, about half a mile in length, which winds through grassy meadows, studded with scattering shade trees, affording delightful picnic or camp grounds. On the north stands Mount Elbert, altitude 14,360 feet above the sea, or 5,027 feet above the lakes. Directly opposite (at the south side of the Lakes) are the Twin Peaks, also giants of the Rocky chain. The sheets are, therefore, thoroughly mountain-locked. The mountains last named are clothed with rare foliage and are full of game. The lakes abound in trout." The paper above quoted says the little steamer plying on Twin Lakes "has the distinguished honor of being nearer to Heaven than any other craft in the wide, wide world."

Business and Personal.

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

The consumption cure of the age is certainly Van Bell's "Rye and Rock."

To Marble Workers.—Good opening for a yard; small capital required. Address A. Gregg, San Sala, Texas.

Wanted—A competent Card Room Overseer for 120 Lowell cards. Address, with reference and wages expected, Natchez Cotton Mills, Natchez, Miss.

When your boiler front is covered with mud from the try cocks, it is a sure sign that no time should be lost in applying Hotchkiss' Mechanical Boiler Cleaner. Send for circular. 84 John St., New York.

The city of Natchez is contemplating the erection of water works, and solicits communications and estimates from parties engaged in that line. Address Henry C. Griffin, Mayor, Natchez, Miss., Lock Box 258.

Party owning Sash, Door, and Blind Factory, wishes to add to his manufacture some Specialty (a good patent preferred) which will meet with large and profitable sales. Address X. Y. Z., Crown Point, N. Y.

Agricultural Engines for sale cheap by S. J. Benedict, East Randolph, N. Y.

Peck's Patent Drop Press. See adv., page 76.

For Sale.—Turret Lathe, with Chaser Bar. No. 1 and 4 Root Blowers. B. & W., 261 N. 3d St., Phila., Pa.

Tarred Roof'g, Sheath'g Felts. Wiskeman, Paterson, N.J.

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

List 26.—Description of 2,500 new and second-hand Machines, now ready for distribution. Send stamp for the same. S. C. Forsaith & Co., Manchester, N. H.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Punching Presses & Shears for Metal-workers, Power Drill Presses, $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N.Y.

Improved Skinner Portable Engines. Erie, Pa.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

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

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

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

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N.Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

For best Duplex Injector, see Jenks' adv., p. 60.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

4 to 40 H. P. Steam Engines. See adv. p. 61.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 78.

Houghton's Boiler Compound contains nothing that can injure the iron, but it will remove scale and prevent its formation. Houghton & Co., 15 Hudson St., N. Y.

Long & Allstatter Co.'s Power Punch. See adv., p. 77.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 77.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 94.

Safety Boilers. See Harrison Boiler Works adv., p. 93.

Saw Mill Machinery. Stearns Mfg. Co. See p. 78.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 93.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 94.

For Machinists' Tools, see Whitcomb's adv., p. 94.

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

Turbine Wheels; Mill Mach'y. O. J. Bollinger, York, Pa.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

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

Ball's Variable Cut-off Engine. See adv., page 108.

Clark Rubber Wheels adv. See page 108.

Brass & Copper in sheets, wire & blanks. See ad. p. 109.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

The Twin Rotary Pump. See adv., p. 78.

Wren's Patent Grate Bar. See adv. page 109.

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

Berryman Feed Water Heater. See illus. adv., p. 110.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. B. Dudgeon, 24 Columbia St., New York.

Eagle Anvils, 10 cents per pound. Fully warranted.

Geiser's Patent Grain Thrasher, Peerless, Portable, and Traction Engine. Geiser M'f'g Co., Waynesboro, Pa.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 109.

Baxter Wrenches fit peculiar corners. Indispensable to first-class mechanics. Greene, Tweed & Co., N. Y.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wares, notions, and novelties in the above line, a specialty. See advertisement on page 62.

Houston's Sash Dovetailing Machine. See ad., p. 110.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 94.

Pat. Steam Hoisting Mach'y. See illus. adv., p. 110.

New Economizer Portable Engine. See illus. adv. p. 110.

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

Rue's New "Little Giant" Injector is much praised for its capacity, reliability, and long use without repairs. Rue Manufacturing Co., Philadelphia, Pa.

The Sweetland Chuck. See illus. adv., p. 109.

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

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

The Common Sense Dry Kiln prevents check, warp, or hardened surface. See St. Albans M'f'g Co.'s adv. p. 60.

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

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

Linen hose, rubber hose, cotton, rubber, and leather belting. Greene, Tweed & Co., 118 Chambers St., N. Y.

Use the Vacuum Oils. The best car, lubricating, engine, and cylinder oils made. Address Vacuum Oil Co., No. 3 Rochester Savings Bank, Rochester, N. Y.

Skinner's Chuck. Universal, and Eccentric. See p. 106.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

(1) C. & Co. write: 1. We have a 6 horse boiler which we use to run off our newspaper one day each week. Which would be best for the boiler, to blow it off each week, or to permit it to stand with the usual amount of water in it? Should it stand empty or filled? A. If you use fresh water, keep the water in the boiler, and after steam is blown off close all openings till you wish to use it again. 2. Which is the best method of preserving small rubber hose when not in use? A. Keep it in water.

(2) X. F. asks how to clean a rusty gun and make it shine brightly. A. Plug the barrel, and rub and scour with fine emery moistened with dilute sulphuric acid (acid 1, water 5), then with emery and oil, and finally with a woolen rag and oil. 2. What is a good and durable wash, silver or nickel, for a gun? A. We know of no practical way of putting on a good coating of nickel or silver by wash. 3. Give me a recipe to silver or nickel-plate a brass telegraph instrument. A. See articles on these subjects on pp. 153, vol. xliii., and 81, vol. xliv. 4. What is a good thing to clean and polish up brass? A. Scour with a little oxalic acid, then with a little fine emery and oil.

(3) J. L. M. asks how to construct a box for holding electroplating solution and articles while being plated. How large should the box be to be supplied with electricity from one-half pint bichromate battery? How must I connect the wires of the battery with the box? A. It depends upon what solution the bath consists of. See instructions for making tanks, etc., for electroplating baths in articles on nickel plating and electro-metallurgy, pp. 153, vol. xliii, 81, 3, 33, 116, and 133, vol. xliv., SCIENTIFIC AMERICAN.

(4) J. B. A. asks: What mixture shall I use to stain a white ash fishing pole a very dark brown. It has already had a coat of varnish? A. Boil ¼ lb. Vandyke brown, and 2 oz. carbonate of soda in 12 oz. of water, and add ¼ oz. of bichromate of potassa; or use a weak aqueous solution of permanganate of potassa in water. It is better to remove the varnish first with sandpaper, and varnish after staining.

(5) F. V. asks: 1. Is there anything I can mix with aniline that I can paint on pearl with that will penetrate as a die and leave the color in the button? A. There is no available mordant. You can use gum water, or colorless French spirit copal or damar varnish as a vehicle. 2. Can you tell me how to etch pearl? What is a good cement to fasten cut steel on pearl and glass? A. You will find the information on pearl and pearl inlaying which recently appeared in this paper. 3. I have some cut steel that has rusted after being fastened on pearl. Can you tell me of something that will take the rust off and not hurt the pearl? A. Use a little oil and emery flour. 4. Is there any way to soften pearl to make it cut easy? A. No. 5. Is there any way to paint with nitrate of silver so it will not spread after putting it on? I also find some difficulty in making the silver go on only in spots; it acts as water does on a greasy surface. A. You can mix the silver solution with a little gum water to prevent spreading.

(6) R. E. M. writes: I have been told by engineers that beef tallow used in a steam engine cylinder would cause the follower and piston heads to wear in holes. We use tallow in our cylinder, and cavities large enough to lay the finger in have appeared in the follower. Do you think it is from the above reason, and why does tallow have this effect? What is the best lubricant for steam cylinder, and where can it be obtained? Is beeswax or black lead good to use in a cylinder? A. Tallow, when submitted to the action of live steam for a time, is partially decomposed, and several fatty acids are liberated which corrode the hot metal. If the cylinder requires it use best mineral sperm oil ground to a thin paste with finest graphite. See Lubricators, page 4, current volume. For addresses of dealers in cylinder oils see our advertising columns.

(7) C. E. R. asks how to make a good green writing ink. Have tried the receipt in SUPPLEMENT, No. 158, and get only a pale yellowish green. A. Make a strong solution of one of the aniline coal tar greens in water.

(8) A. C. B. writes: I wish to set an engine, and think of setting on a concrete foundation. Sand and gravel are not more than forty feet distant; Stone for building purposes about a mile and a half. Will concrete make as good a foundation as stone? If so, what cement is best, and how prepare and proceed? Engine is 7¾x18 inches, and runs 300 revolutions per minute, running circular saw. A. We recommend you to use stone; concrete, if not of the very best, will be apt in time to give way under the action of the engine.

(9) R. A. R. writes: 1. I am building a grain elevator, in which the grain will be lifted to a height of about 45 feet from the pit, and it is desirable that the elevator head should be, as nearly as possible, perpendicularly over the foot. Would a slope of two or three feet in that height be sufficient? And would it discharge properly with that slope if run at from 150 to 180 feet to the minute? A. No; buckets would not deliver. Speed of buckets should be at least twice 180 feet per minute. 2. What width of rubber or leather belting would be required to drive the above, the belt running at 180 feet to the minute, over a 16 inch pulley on elevator shaft at top, and driven by a 3 foot pulley at bottom (distance between the pulley shafts 30 feet), the power being one horse? A. 8 inches wide; the upper pulley should be nearly or quite 4 feet diameter. 3. Which would be the best for the last mentioned belt, rubber or leather? A. Rubber. 4. How many bushels per hour should one horse be able to elevate to the height mentioned, making a fair allowance for friction, etc.? A. About 1½ bushels per minute, at a speed of 530 feet.

(10) C. asks: 1. When a belt between two pulleys runs true and even on one of the pulleys and has a tendency to run off the other, the presumption is that the shaft of the latter is not level, and if so, will the belt run off the higher or the lower edge of the pulley? A. The two edges of the belt run at different velocities and the belt travels toward the side running at the highest velocity. 2. Why is it that the same belt has sometimes a tendency to run off the same side of both pulleys? A. Probably because the two sides or edges of the pulleys have different diameters. 3. Is there any cheap publication which gives all necessary information respecting belting, its strength, the best methods of lacing, etc.? A. "Cooper's Use of Belting," price about $3.50.

(11) C. M. K. asks: Can you give me some good and cheap plan of making a "bar photometer" for testing the candle power of gas or other light? A. See photometers and photometry, in Nos. 64, 30, 44, 8, 43, 236, 234, and 253, SCIENTIFIC AMERICAN SUPPLEMENT.

(12) L. C. (Razan) says in regard to silver-plating large articles with a small bath: I have often silvered, with a sponge, very large objects for which I had no vessel big enough, and the matter is very simple. I take the anode (copper wire) and wind it around a wooden stick, connecting the object (as cathode) with the negative (zinc) pole. The two are then brought into contact and kept moist with a sponge dipped in the plating bath. In this way plate either brass, German silver, or Britannia metal, to any thickness desired.

(13) W. L. writes: I have noticed in several answers to correspondents and in at least one article in your valued paper an allusion to what they call the whitewash on the "White House." As I know something of that preparation I think it proper that I inform you and your many readers. About the year 1836, John Ogden Dey, Esq., a maternal uncle of mine, visited Washington. He was a man of very observant habits, and in his inspection of the White House and the old Capitol building (the central part of the Capitol as it now stands) he found that the stone of which it was erected was being acted on severely by the weather, the outside of the stones had splintered by exposure and contraction and the disintegrative effect of the atmosphere to such an extent as to seriously threaten its permanency. He sought the Committee on Public Buildings and proposed to remedy the evil, not with stucco, but with a cement wash. After a full interchange of opinion he was empowered to send the material and instructions to Washington, which he did; and it was put on the next year, and has stayed there ever since, protecting the building material effectually. The information was given without fee or reward. The old man has passed away long since, and, in justice to his memory, as well as to inform the public, I have penned this. The material used was "Onondaga Hydraulic Cement," from State of New York, mixed with a small amount of glue and with milk, the exact proportions I do not now remember. I have seen several brick houses covered with this cement that has stood all kinds of weather for years. Some I have in mind were washed thirty-five years ago, and still retain the full coat and look as well as when put on. The cement has to be applied soon after it is mixed, and put on as thick as the brush will carry it. Sometimes two or more coats are required.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

July 19, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 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. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Abdominal supporter, J. Diel 244,561
Advertising device, J. O. Belknap 244,371
Alloys for anodes, producing, W. Frishmuth 244,445
Animal trap, R. Elliott 244,572
Anvil, punch, and shears, combined, H. A. Schneekloth 244,488
Auger, portable steam, W. F. Leach 244,629
Axle, vehicle, W. S. Platt 244,661
Badge, P. S. Hoffman 244,457
Bale tie, J. L. Griffin 244,591
Baling press, A. D. Channell 244,547
Baling press, J. N. Grant 244,438
Beads, machine for stringing, W. Halstenbach 244,452
Bed bottom, spring, J. Lokie 244,633
Bed, hospital, Jensen & Olsen 244,612
Bedstead, wardrobe, E. N. Doring 244,567
Binder, temporary, A. F. Shorey 244,678
Blast furnace, J. M. Hartman 244,454
Blast furnace, P. L. Weimer 244,408
Blow pipe, M. H. Knapp 244,623
Board. See Telephone switch board. Vignette board.
Boiler. See Steam boiler.
Boiler feeder, automatic, B. T. Babbitt 244,518
Boiler furnace, straw burning, A. A. Culver 244,436
Bolting chest, A. P. Gross 244,589
Bolting cloths, tightening, I. Dick 244,383
Book rest, J. Swartz 244,406
Boot treeing machine, T. Barrett 244,423
Boot treer's rub stick, T. Barrett *et al* 244,710
Box. See Locomotive fire box.
Box for ruching, laces, etc., A. Back 244,519
Boxes, manufacture of, W. H. Allen (r) 9,815
Bracelet, E. A. Thiery 244,687
Button, O. C. Devereux 244,560
Button and stud, C. A. Fautz 244,441
Button, sleeve, D. F. Adams 244,368
Calendar, revolving, G. F. McIndoe 244,469
Can. See Sheet metal can.
Can filling machine, H. J. Clark 244,378
Car brake, A. C. Springer 244,495
Car coupling, A. A. Armitage 244,366
Car coupling, A. M. Béchard 244,424
Car coupling, J. R. Nickols 244,650
Car door lock, C. W. Preston 244,665
Car, freight, F. Klier 244,622
Car heater, W. C. Baker 244,522
Car motor, street, J. S. Lewis 244,631
Car propulsion, apparatus for street, J. B. Cline 244,713
Car seats, limb support for, C. Beggs 244,529
Car starter, R. C. Smith 244,680
Car, stock, C. G. L. Frik 244,444
Car wheel, A. M. Wright 244,412
Carbureting apparatus, gas or air, J. W. Hoard *et al* 244,387
Carburetor, J. Clingman 244,434
Card fillets, apparatus for covering cylinders with, J. S. Dronsfield 244,568
Carding machines, mechanism for stripping the flats of, G. H. Chandler 244,546
Carpet lining, machine for making, G. K. Stinson 244,496
Carpet roll core, G. S. Griffith, Jr 244,593
Carriage seat, W. P. Ginter 244,585
Carrousel, T. A. Carl 244,376
Case. See Piano case. Shot case. Show case.
Cash register, W. C. Vajen 244,692
Caster and corner clamp for trunks, combined, W. B. Gould 244,447
Centrifugal machine, T. H. Müller 244,473
Chain, ornamental, H. Wexel (r) 9,814
Chair. See Dental chair. Reclining chair.
Check register, Loomis & Yates 244,465
Chest. See Bolting chest.
Chimney draught mechanism, J. G. Müller 244,472
Churn, I. V. & J. R. Myers 244,647
Cider press, J. W. Arnold 244,516
Cigar machine, O. Hammerstein 244,453
Cinder and dust arrester, J. F. Legate 244,630
Clasp. See Hitching clasp. Hook clasp. Safety clasp.
Cleaner. See Steam boiler cleaner.
Clock escapement, C. Stahlberg 244,684
Clocks, stem winding attachment for, C. Guilberg 244,451
Clutch, friction, B. Smith 244,498
Clutch, steam, T. Dill 244,717
Cock and faucet, self-closing, J. Broughton (r) 9,816
Coffin handle socket, W. M. Smith 244,681
Coke oven door, C. Beam 244,528
Collar coupling, horse, A. D. Shepard 244,490
Collar fastening, horse, S. Peters 244,657
Corset, M. Adler 244,511
Corset, L. A. Downs 244,385
Corset, D. H. Fanning 244,573
Cotton gin, D. D. Clark 244,549
Cotton press, Griffin & Winborne 244,592
Coupling. See Car coupling. Collar coupling.
Crate for the transportation of fruit and live stock, combination, Wilson & Henning 244,409
Cultivator, E. Barrows 244,369
Dental chair, A. W. Ross 244,487
Desk and folding wardrobe bed, combined, E. N. Doring 244,566
Die, R. A. Bacon 244,520
Dish washer, M. A. Brass 244,540
Ditching machine, G. G. Lynch 244,466
Ditching machine, F. Plumb 244,400
Door hanger, A. C. Arnold 244,418
Dredging machine, Parks & Freeman 244,480
Dropper. See Seed dropper
Dye tub, G. Yule 244,509
Egg poacher, L. E. Adams 244,415
Electric lights, apparatus for treating carbon pencils for, W. Sawyer (r) 9,807
Elevator and carrier, D. Dockstader 244,563
Emery or grinding wheels, mounting and supporting solid, E. R. Ware 244,699
Engine. See Hydraulic engine. Rotary steam engine. Paper pulp engine.
Envelope machine, A. A. Rheutan 244,485
Evaporator and drier, C. G. Till 244,699
Excavating machine, T. Dill 244,718
Explosive blasting material, Faure & Trench 244,575
Extractor. See Stump extractor.
Eyeglasses, bow spring for, F. Terstegen 244,686
Fabric. See Tubular fabric.
Fanning mill, Kissen & Schwarz 244,620
Fence wire, machine for twisting, H. N. Frentress 244,579

Fence wire stretcher, A. H. Calkins 244,375
Fence wires to posts, device for attaching, T. S. Woodruff 244,411
Filter, G. H. Moore 244,471
Filter, P. Wells 244,701
Fire in oil tanks, extinguishing, C. Barnes..244,421, 244,422
Fire screen and fender, combined, J. C. Matthews 244,397
Fish, desalting the skins, bones, and tissues of salt, P. C. Vogelius 244,502
Fly screen, R. C. Ludlow 244,637
Folding screen for beds, E. C. Johnson 244,613
Folding table, D. J. Powers 244,401
Furnace. See Blast furnace. Regenerative furnace.
Gas apparatus, J. S. Wood 244,705
Gate, D. H. Jarrard 244,611
Generator. See Thermo-electric generator.
Glass and iron, composition of matter for moulded articles to resemble, E. Rosenzi 244,496
Glove fastening, E. Loewenthal 244,632
Glove fastening, J. B. Pings 244,559
Grain and seed separator, I. Barnett 244,526
Grain meter buckets, spring buffer for, J. G. F. L. Dieter 244,562
Gun, air, H. M. Quackenbush 244,484
Gymnastic apparatus, A. C., C. H., & J. H. Gifford. 244,388
Hame fastener, C. Hutchins 244,709
Hames, combined draught eye and hold back for harness, F. A. Bingham 244,428
Hammer, power, A. Beaudry 244,370
Hammers, nail holding and starting attachment for, G. C. Peeling 244,655
Hammock, V. P. Travers 244,690
Handle. See Saw handle.
Harness attachment, J. C. Covert 244,555
Harness check hook, J. Paar 244,653
Harness fastening, spring, H. M. Orcutt 244,475
Harvester cutter bar, P. C. Crees 244,435
Hay and grain elevator, E. M. Deane 244,715
Heater. See car heater.
Heater and feeder, T. Craney 244,556
Heating water by electricity, apparatus for, E. R. Whitney 244,704
Hinge for landau tops, Johnston & Rasmussen ... 244,616
Hinge, lock, J. A. Klein 244,621
Hinge, spring, Boyden & Brown 244,539
Hinge, spring, W. Gilfillan 244,584
Hitching clasp, J. J. Burke 244,543
Hobby horse, A. Goodspeed 244,586
Hog cholera compound, Miller & Stover 244,643
Hoisting engine, T. Dill 244,716
Hoisting machine, W. B. Padgett 244,654
Holder. See Lamp holder. Rein holder. Lead and crayon holder. Sewing machine needle holder. Music book holder. Spoon holder.
Hook. See snap hook.
Hook clasp, T. Armstrong 244,514
Hops for brewing purposes, purification of, J. Walker 244,695
Horseshoeing hammer, nail clincher, extractor, etc., combined, R. M. Thompson 244,688
Hose coupling, swivel joint for, R. J. Gilmore 244,446
House. See Ice house.
House, B. R. Hawley 244,455
Hub boring machine, Duffey & Vandenburgh 244,439
Hydrants, street connection for, M. Folliard 244,577
Hydraulic engine, C. Massie 244,639
Ice house, ice box, and refrigerator, J. Brauer 244,374
Insulating material, W. P. Dodson 244,565
Iron or steel, dephosphorizing and otherwise purifying molten, J. Walker 244,696
Jack. See Lifting jack. Wagon jack.
Joint. See Rail joint.
Jug cover, H. Wright 244,415
Jute, preparing and bleaching, J. J. Sachs 244,674
Lamp, F. A. Taber 244,407
Lamp, electric, C. G. Perkins 244,481, 244,482
Lamp holder, electric, O. Kartzmark 244,462
Lamp supporter, J. H. Gramps 244,589
Lamps, carbon holder for electric, Tregoning & Maxim 244,501
Land leveling machine, R. A. McCord 244,467
Lantern, E. B. Requa 244,670
Lasting machine, G. W. Copeland *et al* 244,714
Latch, reversible, J. A. Owens 244,477
Lead and crayon holder, C. W. Boman 244,429
Lifting jack, S. M. Baird 244,521
Lifting jack, H. W. Goodwin 244,587
Light. See Signal light. Skylight.
Liquors, apparatus for purifying alcoholic, B. A. Osgood 244,476
Lock. See Car door lock. Nut lock. Permutation lock.
Lock, J. H. Barnes 244,525
Locomotive fire box, Kearney & Hawley 244,392
Mashing machine, F. Fiederlein 244,576
Mashing potatoes, etc., machine for, A. Hoguet .. 244,604
Measure and weighing scale, combined, Graves & Partrick 244,449
Measuring machine, cloth, E. F. Hassler 244,598
Mirror, toilet, F. J. Kaldenberg 244,617
Milk or cream, can for transporting, J. G. Cherry (r) 9,811
Mill. See Fanning mill.
Music book holder, R. Alden 244,512
Nails, machine for making cut, Soule & Packard .. 244,494
Newspaper wrapping and addressing machine, L. C. Crowell 244,559
Nose ring, P. Drais 244,719
Nut lock, J. B. Abernathy 244,510
Nut lock, J. G. Willard 244,506
Nut, thumb, Coulter & Churchill 244,379
Oil tank, A. W. Newell 244,649
Ores, apparatus for utilizing the scum from pulverized, P. H. Dunagan 244,569
Packing pipe joints, W. R. Patterson 244,479
Paper bag, L. Planche 244,483
Paper box for cigarettes, J. Bamberger 244,523
Paper cutting machine, E. R. Sheridan (r) 9,809
Paper pails, machine for the manufacture of, E. Hubbard 244,607
Paper pulp engine, J. R. Abbe 244,414
Paper pulp, grinding wood for, S. M. Allen 244,416
Paraffine, apparatus for and process of treating, F. X. Byerley 244,431
Percussion table, concentrating, M. B. Dodge 244,564
Permutation lock, J. C. Baird 244,419
Permutation lock, L. Jessel 244,459
Piano case, upright, W. A. Lorenz 244,635
Pill, medicinal tonic, J. Newton 244,474
Pin setting mechanisms, machine for holding sheet rubber for the action of, J. A. Horton ... 244,606
Pipe. See Blow pipe.
Pipe fastener, petticoat, P. J. Cleary 244,552
Plaiting machine, J. Haines 244,596
Planing machine, S. A. Woods 244,507
Plow, J. Austin 244,367
Plow, R. C. McGinnis 244,642
Plow, et al., combined, T. Ward 244,504
Plow stock, J. M. Pitts 244,660
Plow, sulky, E. Yeiser 244,708
Plumbers' traps, air vent or inlet for, W. McElroy 244,468
Pocketbook and purse, L. Knittel 244,732
Polishing compound, H. L. Hass 244,595
Pool and billiard tables, pocket support for, A. W. Bailey 244,368
Preserving fruit juices, C. A. Axline 244,517
Press. See Cider press. Cotton press.
Press, G. H. Reynolds 244,672
Printer's chase, adjustable, Snyder & Ivins 244,682
Propeller, vessel, R. Gawne 244,582
Pulp for transportation and sale, manufacture of dried wood, S. M. Allen 244,417
Pulping engines, etc., apparatus for actuating the followers of wood, W. Jones 244,461
Pump, J. W. Douglas 244,384
Pump, J. Mayher 244,641
Pump, T. Rose 244,673
Pump, H. C. Taylor 244,407
Pump, force and suction, B. Branson (r) 9,810
Pump, steam, M. Schultz (r) 9,818
Pumps by compressed air, operating, E. Hill 244,601
Quadrats, mechanism for cutting off and elevating lines of, Lorenz & Johnson 244,636
Rack. See Whisky rack.
Rail joint, C. P. Johnson 244,460
Railway, pneumatic, Bardwell & Nolan 244,524
Railway signal apparatus, M. C. Bragdon 244,430
Railway tracks, automatic switch for, Watson & Garsed 244,700
Rake teeth, apparatus for straightening, J. B. Hamblin 244,597
Reclining chair, G. A. Keene 244,463
Refrigerating apparatus and method of using the same, E. Hill 244,601
Refrigerating cars, method of and apparatus for cooling, E. Hill 244,602
Refrigerating chamber, W. Scott 244,676
Refrigerator, Bundock & Mapel 244,542
Refrigerator car, railway, A. F. & D. M. Higgs 244,456
Regenerative furnace, rotative, C. W. Siemens ... 244,492
Register. See Cash register. Step or platform register. Check register.
Rein holder, E. C. Clarke 244,550
Riveting machine, G. Cumming 244,437
Rock drill, S. Hussey 244,608
Rocking chair foot rest, L. K. Dutton 244,570
Rotary steam engine, D. L. Cross 244,558
Rubber for packing, etc., sheet, G. K. Crawford ... 244,557
Saddle, C. H. Veeder 244,693
Saddle girth fastening and harness buckle, Lancaster & Sears 244,624
Safety clasp, F. Armstrong 244,515
Safety pin, C. L. Norton 244,651
Sand and water break, Maxson & Buck 244,640
Sand mould and flask for moulding, M. Freeman. 244,443
Sash balance, A. Anderson 244,513
Sash holder, L. C. Strong 244,405
Saw handle, crosscut, J. Hilton 244,301
Saw handle, detachable, J. Hilton 234,290
Scale for wagons, weighing, W. L. Yohn 244,709
Scissors and pencil holder, combined, J. H. Woodward 244,508
Scraper, earth, A. R. Byrkett 244,432
Scraper, road, J. N. & T. Wallis 244,698
Screen. See Fire screen. Fly screen. Folding screen.
Screw, coffin, E. S. Wheeler 244,702
Screw cutting device, W. L. Bergen 244,427
Seat. See Carriage seat.
Seed dropper and marker, J. S. Voorhees 244,694
Separator. See Grain and seed separator.
Sewer trap, W. Bedell 244,425
Sewing and trimming fabrics, machine for, J. Bigelow ..... 244,530 to 244,533
Sewing machine, J. H. Mooney 244,470
Sewing machine, button hole, J. S. Freese 244,578
Sewing machine needle holder, J. Tisdale 244,500
Sewing machines, loose pulley for, J. I. Reynolds. 244,671
Shafts, pillow block for, I. M. Scott 244,489
Shears, M. C. Johnson 244,614
Sheet metal can, J. Solter 244,683
Shoe, H. Grabach 244,588
Shoe fastening device, S. G. Blackman 244,534
Shoes, etc., fastener for, I. J. Saunders 244,675
Shoes, tool for removing buttons from, C. H. Terpany 244,498
Shot case and distributer, S. Booton 244,537
Show case, revolving, A. H. Hill 244,600
Signal light, floating, R. Pintsch (r) 9,812
Skate, roller, W. H. Bliss 244,372
Skylight, Campbell & Dunlevy 244,711
Snap hook, D. F. Laughlin 244,627
Snow and ice from streets, apparatus for removing, O. F. Boomer 244,536
Snow plow, L. Morgan 244,398
Soldering iron, J. Carroll 244,377
Sole pressing machines, diaphragm support for, T. H. & T. J. Gifford 244,583
Spindle and means for supporting the same, C. H. Chapman 244,712
Spindles, making shell, C. H. Chapman 244,548
Spinners' staples, machine for opening and cleaning, S. D. Keene 244,393, 244,394
Spinning machine spindles, combined bolster and step for, G. H. Miller 244,644
Spoon holder and call bell, combined, Beach & Berry 244,527
Spoon, medical and nursery, H. Clayton 244,551
Spring. See Wagon spring.
Stamps, canceling device for postage, revenue, and other, J. P. Farmer 244,574
Steam boiler, A. M. Wylie 244,707
Steam boiler cleaner, C. Reiser 244,668
Steam boilers, heating and blow-off apparatus for, J. S. Griffith 244,450
Steam trap, D. Edwards 244,571
Steam, utilizing exhaust, D. Renshaw 244,669
Steering apparatus, steam, L. W. Brown 244,541
Step or platform register, D. L. Tower 244,699
Still, alcohol, O. L. Perin 244,656
Still for ammonia, spirits, etc., C. C. Parsons 244,399
Stone pavement and block, artificial, R. H. Guyer 244,594
Stool, rotary, E. N. Tuttle 244,691
Stove pipe elbow, F. Hildebrandt 244,720
Stove pipe threader and beader, E. M. Ball 244,420
Straw rope or band making machine, J. Gardner. 244,580
Stump extractor, J. L. Neville 244,648
Sulky, trotting, C. F. Stillman 244,404
Supporter. See Abdominal supporter. Lamp supporter.
Suspenders, I. H. Garson 244,581
Syringe, C. Oyston 244,652
Table. See Folding table. Percussion table. Turn-table.
Tack capping machines, separating device for, H. R. Packard 244,478
Tag, M. M. Reis 244,667
Tank. See Oil tank.
Tea kettle spouts, boss for, J. H. Smith 244,402
Telephone, H. G. Cady 244,544
Telephone, F. K. Fitch 244,442
Telephone circuit, A. G. Bell 244,426
Telephone circuits, signal operating device for, W. H. Day 244,382
Telephone, electric, W. Main 244,698
Telephone switch board, T. W. Lane 244,625
Telephone switch board, Lane & Gleeson 244,626
Telephonic transmitting instrument, E. T. Greenfield 244,590
Terret, overcheck, J. Hudson 244,458
Tether, horse tail, C. Shrewsbury 244,491
Thermo-electric generator, C. A. Randall 244,666
Thrasher cylinder teeth, machine for threading, H. M. Smith 244,759
Thrashing machine, J. C. Hooven 244,605
Tie. See Bale tie.
Tire, wheel, A. Brady 244,373
Toe weight, J. Fenton 244,390
Toy furniture, Pierce & Bernhard 244,658
Toy horse and wagon, F. W. Carpenter 244,433
Toy savings bank, J. Murray 244,646
Toy watch, J. G. Powell 244,663
Trap. See Animal trap. Sewer trap.
Trunk catch, G. Minchin 244,645
Tub. See Dye tub.
Tubular fabric and the method of weaving the same, W. H. Lord 244,395
Turn-table, C. & G. White 244,703
Type distributing machine, L. K. Johnson 244,721
Type distributing machine, Lorenz & Johnson 244,725
Type distributing machines, carrier for, W. A. Lorenz *et al* 244,724
Type in lines, machine for arranging, Lorenz & Johnson 244,723
Type setting machine, W. A. Lorenz 244,634
Umbrella and parasol, W. Carter 244,545
Urinal, R. P. Daggett 244,381
Vehicle foot rest, C. F. Stillman 244,403
Vehicle running gear, J. Herbrand 244,599
Vehicle spring, J. C. Crawford 244,380
Vehicle, two-wheeled, D. B. Jackson *et al* 244,610
Vent for casks, J. Luger 244,396
Vignette board, C. W. Earle 244,440
Wagon jack, H. T. West 244,505
Wagon spring, S. G. Clough (r) 9,813
Wagon spring, E. Horton (r) 9,808
Wall paper, manufacturing, W. C. Walter 244,503
Washer. See Dish washer.
Washing machine, W. C. Johnson 244,615
Washing machine, T. M. Lane 244,464
Washing machine, G. Work 244,706
Watch case fastening, J. M. Cookingham 244,553
Watch trains, machine and device for end shaking, C. E. Dodge 244,438
Water closet, W. Blackwood, Jr. 244,535
Water gate, J. S. Powers 244,664
Water motor, W. Lay 244,628
Weigher, automatic grain, C. Wals 244,697
Wheelwright machine, C. Anderson 244,365
Whip stock, G. King 244,619
Whisky rack for bonded warehouses, construction of, T. J. Pottinger 244,662
Windwheel, A. Sherwood 244,677
Winding and twisting machines, etc., stop motion mechanism for, J. Boyd 244,538
Windlasses, rope drum for, J. Knowlson, Jr. (r) ... 9,806
Wire barbing machine, J. H. Coon 244,554
Wire fastener, T. S. Woodruff 244,410
Wire stretcher, W. Z. Dafoe (r) 9,817
Wire testing machine, E. E. & I. Kilmer 244,618
Wrench, J. H. Strickler 244,685

DESIGNS.

Bracelet, A. Wallace 12,370
Carpet, T. J. Stearns 12,369
Finger ring, C. Krauss 12,365
Glassware, H. Gerstmann 12,363
Knitted fabric, A. B. Dodge 12,362
Parasol, A. Lyon 12,367
Mirror frame, D. S. Plumb 12,368
Sauce pan handle, L. & W. H. Berger 12,361
Scales, face plate and frame for weighing, Lusk & Huebner 12,366
Stoves, fire grate for oil, P. Hickisch 12,364

TRADE MARKS.

Asthma cure, B. W. Hair & Son 8,473
Beer, lager, Weber & Schillinger 8,490
Buttons, Williston, Knight & Co 8,492
Chemicals, A. Pirz 8,489
Cigarettes, Compagnie Laferme 8,485
Cigars, J. W. Love 8,480
Cigars, cigarettes, and smoking and chewing tobacco, J. W. Love 8,487
Coffee, roasted, E. & R. Mead, Jr., & Co 8,501
Dentifrice, liquid, S. R. Van Duzer 8,498
Files and rasps, G. & H. Barnett 8,499
Gin, holland, U. Wolfe 8,506
Hair dressing, S. R. Van Duzer 8,493
Horse powers, Aultman & Taylor Company 8,496
Lard, N. K. Fairbank & Co 8,500
Meat juice and a compound of meat juice and glycerine, M. S. Valentine 8,484
Medicine for cure of catarrh and an invigorator and salve, A. F. Evory 8,472
Medicine, hay fever, asthma, and catarrh, M. M. Townsend 8,491
Metal, anti-friction, Diamond Anti-friction Metal Company 8,479
Pencils, lead, E. Faber 8,494
Plows, A. Speer & Sons 8,504, 8,505
Plows, harrows, and cultivators, A. Speer & Sons ... 8,503
Refrigerators and ice chests, J. C. Jewett & Sons ... 8,495
Remedies for diseases of the lungs and throat, F. E. Schmitz 8,482
Soap, laundry, Lautz Bros. & Co 8,496
Syringes, rubber, Rubber Comb and Jewelry Co 8,502
Thrashing machines, Nichols, Shepard & Co 8,488
Tobacco, cigars, cigarettes, and snuff, smoking and chewing, W. Duke, Sons & Co 8,471
Tobacco, plug, Johnston Tobacco Company 8,474
Tobacco, smoking and chewing, W. C. Thomas 8,483
Whiskies, Lilienthal & Co ..... 8,475 to 8,479
Whisky, J. M. O'Donnell 8,497
Whisky, sour mash, M. P. Mattingly 8,481

English Patents Issued to Americans.

From July 12 to July 15, 1881, inclusive.

Anchor, S. S. Chapleau *et al*., New York city.
Book binding machine, S. E. Mower, Milford, Conn.
Cake machinery, J. H. Mitchell, Philadelphia, Pa.
Cigarette machine, J. A. Bonsack, Bonsack, Va.
Dredging machine, J. Menge, Point Michel, La.
Electric lamp, L. G. Woolley, Mendon, Mich.
Envelope printing apparatus, S. A. Grant, Boston, Mass.
Hammock, V. P. Travers, New York city.
Journal bearing, J. R. Baker, Jersey City, N. J.
Slag treatment of fluid, A. D. Elbers, Hoboken, N. J.
Spring motor, J. B. Powell *et al*., Philadelphia, Pa.
Tubing, manufacture of, A. S. Murphy, Philadelphia, Pa.

Advertisements.

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

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

THE ADVERTISER WISHES TO GET a "Self-contained, Direct-acting" Circular Saw Mill, with about a five or six foot saw on end of engine shaft, and having a travel of carriage only sufficient to cut logs of eight foot lengths. Address, with descriptive circular, prices, etc., ADVERTISER, Station G, Post Office, Brooklyn, N. Y.

STENOGRAPHIC REPORTING MACHINE.—A description of M. Michela's stenographic reporting machine, which has attracted great attention in Europe, and been practically and successfully tested by the French Chamber of Deputies and Senate, and the Italian Parliament. An apparatus which inscribes by syllables, instead of letter by letter as done by former writing machines. With 5 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 278. Price 10 cents. To be had at this office and from all newsdealers.

30 DAYS TRIAL ALLOWED.

We will send on 30 days trial
DR. DYE'S
Electro-Voltaic Appliances.

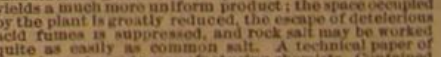
Invented by the **eminent Dr. A. M. Dye,** and especially designed for the cure of all **Nervous Diseases, General Debility, Lost Vigor** and **Manhood,** the result of **abuses** and **other** causes. Also for Liver and Kidney Diseases, Rheumatism, Neuralgia, Paralysis, Rupture, **Female Troubles** and **many other diseases.** Wonderful cures quickly effected. Illustrated pamphlet sent free. Address,

VOLTAIC BELT CO., Marshall, Mich.

SCIENTIFIC BREEDING.—BY J. D. CAton. An interesting paper, on the scientific breeding of domesticated animals—especially of the horse, pointing out the astonishing improvements which, in recent years, have been successively wrought by intelligent and judicious selection. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 273. Price 10 cents. To be had at this office and from all newsdealers. The same number contains the pedigree and performances of "Don Cossack," with a portrait of the animal.

SEND TO LONDON, BERRY & ORTON PHILA PA FOR
THE BEST BAND SAW BLADE

ASPHALTUM.—A COMPREHENSIVE paper, treating of its geological origin, mode of preparation for industrial purposes, and most important applications. Bitumen, Chemical Composition, and Physical Properties. Geographical distribution. Geological origin. Formation of Asphaltum. Bituminous mastic. Uses and applications of Crude Asphaltum. Mode of preparation for sidewalks and pavements. Applications of Bituminous Mastic or Cement. Asphalt as a preservative against fires. Illustrated with engravings, showing the probable formation of asphaltum in soft limestone strata; the construction of pavements from crude asphalt at Paris, and the mode of making sidewalks. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 276. Price 10 cents. To be had at this office and from all newsdealers.



SULPHATE OF SODA.—BY JAMES MACtear, F.C.S. A history of the former methods of manufacturing sulphate of soda or "salt cake," and the inconveniences connected therewith, followed by a detailed description of the author's new mechanical furnace, and of his new continuous system of manufacturing this important chemical product. By the use of the Mactear system thirty per cent. is saved in the manufacturing costs; the operation is continuous, and yields a much more uniform product; the space occupied by the plant is greatly reduced, the escape of deleterious acid fumes is suppressed, and rock salt may be worked quite as easily as common salt. A technical paper of great importance to manufacturing chemists. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 277. Price 10 cents. To be had at this office and from all newsdealers. The same number contains an article on a "New Process for Extracting the Iodine contained in Sea-weeds," by Messrs. Laurdt & Collett.

INDUSTRIAL CHEMISTRY—BRIEF REview of the most important changes in the applications of, within the last few years. By J. W. Mallet. Treating of: *Materials and Processes Connected with the Construction of Buildings.* 1. Chief building materials for external use, stone and brick. 2. Lime burning, mortar and hydraulic cements. 3. Stucco. 4. Preservation of timber. 5. Glue and other cements of various applications. 6. Pigments for the use of house painters. 7. Dyes. 8. Varnishes. *Building Appliances.* Vehicles for paints. 8. Varnishes. *Building Appliances.* A. Explosive agents, used in blasting and otherwise. B. Disinfectants. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 277. Price 10 cents. To be had at this office and from all newsdealers.

WATER ELEVATOR, OR STEAM JET PUMP.

Has no valves or moving parts. With 40 lb. steam pressure will elevate hot or cold water 50 ft., will force water through pipes and hose for fire purposes. Cheapest and Best Pump made. A 1¼ in. pump, price $7.50, will throw a ⅝ stream of water 40 ft.; 2½ in. pump, price $14, at 50 lb. pressure, elevates 3,000 gal. 26 ft. per hour. All pumps guaranteed. Send for catalogue of Eng'rs' and Mach'ts' specialties.

VAN DUZEN & TIFT, Cincinnati, O.

Orton's Underground Treasures. A New Edition.
JUST READY.

Underground Treasures:

How and Where to Find Them.—A Key for the Ready Determination of all the Useful Minerals within the United States. By James Orton, A.M., late Professor of Natural History in Vassar College, N. Y., etc., etc. A New Edition with Additions. Illustrated. In one volume, price $1.50, by mail free of postage to any part of the world.

CONTENTS.

CHAPTER I. INTRODUCTION.—Money in the Rocks; The Underground Wealth of our Country; Valuable Minerals Disguised; How Great Fortunes are Missed; Number of Minerals in the United States; Object of this Work, and How to Use It; The Best Mineral Regions. II. DIRECTIONS FOR DETERMINING SPECIMENS BY THE KEY.—How to Test Minerals with the Simplest Means; Prospecting with a Jack-knife and Common Sense; Use of the Key; How to tell Pyrites from Gold, and Quartz from Diamond; All the Useful Minerals Grouped According to Hardness and Color. III. DESCRIPTIVE LIST OF USEFUL MINERALS.—The Gems; Precious Metals; Valuable Ores and Useful Minerals of the United States from Agate to Zinc; Their Distinguishing Characters, Uses, and Localities; A Mineralogy for Miners; Agate; Alum; Amethyst; Anthracite; Antimony Ore; Asbestos; Asphaltum; Azurite; Baryta; Bituminous Coal; Blende; Bog Iron Ore; Brittle Silver Ore; Brown Coal; Calamine; Cannel Coal; Carnelian; Celestine; Cerussite; Chromic Iron; Cinnabar; Cobalt Pyrites; Copper; Copper Glance; Copper Nickel; Copper Pyrites; Diamond; Emery; Fluor Spar; Franklinite; Galena; Garnet; Gold; Graphite; Gray Copper Ore; Gypsum; Horn Silver; Iron Pyrites; Jasper; Kaolin; Lenticular Iron Ore; Limonite; Magnetic Iron Ore; Magnetic Pyrites; Malachite; Manganese Spar; Marble; Mica; Micaceous Iron Ore; Niter; Oxyd of Manganese; Platinum; Red Copper Ore; Red Hematite; Red Silver Ore; Rensselaerite; Rock Crystal; Rock Salt; Rutile; Serpentine; Silicate of Copper; Silver; Silver Glance; Smaltine; Smithsonite, Spathic Iron; Specular Iron; Spinel Ruby; Steatite; Strontianite; Sulphur; Tin Ore; Topaz; Tourmaline; Variegated Copper Ore; Wad; Willemite; Zincite. IV. PROSPECTING FOR DIAMONDS, GOLD, SILVER, COPPER, LEAD, AND IRON.—Mineral Riches, how Discovered; Indications; Searching for Diamonds, and how to Distinguish them; Paying Localities of Gold; "Fool's Gold;" Prospecting for Silver and Copper; Where to Look for Lead and Iron. V. ASSAY OF ORES.—When an Ore will Pay; Washing for Gold and Platinum; How to Assay Gold in the Simplest Way; To Test any Rock for Gold and Silver; To Find the Purity of Gold; To Detect and Assay Silver Ores; Assay of Copper, Iron, Zinc, Tin, and Lead Ores; Ready Method of Testing Graphite. VI. MINERAL SPRINGS.—What are Mineral Springs; General Location; Gas Springs; Iron Springs; Sulphur Springs; Alum Springs; Epsom Springs; Salt Springs; Warm Springs; Artesian Wells and Oil Wells, and Where to Bore for Them. VII. ARTIFICIAL JEWELRY—HOW MADE AND HOW DETECTED.—Mock Diamonds; "Paris Brilliants;" The Manufacture of Pastes; False Ruby, Topaz, Sapphire, Emerald, and Carnelian; How to Distinguish True and False Gems; Imitation Pearl and Coral; Artificial Gold; List of Precious Stones. VIII. DISCOVERY OF GOLD IN CALIFORNIA. IX. DISCOVERY OF SILVER IN NEVADA. UNITED STATES GOLD AND SILVER STATISTICS.

☞ *The above or any of our Books sent by mail, free of postage and at the Publication Price, to any address in the World. Our various Catalogues of Practical and Scientific Books sent free to any one who will apply.*

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

DO YOUR OWN PRINTING

Presses and outfits from $3 to $500. Over 2,000 styles of type. Catalogue and reduced price list free.

H. HOOVER, Phila., Pa.

HAND BOOK FOR STEAM ENGINEERS.
Indorsed: Knowles Steam Pump Works, Crane Bros. M'f'g Co., and others. Price only $1.00. Address J. H. KERRICK & CO., Publishers, Indianapolis, Ind.

McKEAN, NEWHALL & BORIE,
Philadelphia (Lovering) Sugar Refinery,
225 CHURCH ST., PHILADELPHIA,
desire to engage a Superintending Chemist, of the best ability, to whom a liberal engagement would be offered.

FOR SALE.
One handsome 10-horse Vertical Engine, with Governor and 4 ft. pulley, 10 in. face, $300. One Jenkins Governor, 4 in. steam pipe, $40. One Judson Governor, 3½ in. steam pipe, $40. All in perfect working order. Apply to PAUL A. OLIVER, Wilkesbarre, Pa.

THE BUTTON FIRE ENGINE WORKS FOR SALE.
This is a rare chance for obtaining a good business. Terms made easy to any individual, firm, or stock company who will continue the business. Address or call on S. BUTTON & SON, Waterford, Saratoga Co., N. Y.

THE BAKER BLOWER.

[FORCED BLAST.]

The best in the World for Charcoal Blast Furnaces.
Also for melting Iron in Cupolas for Stove Foundries, etc.
WILBRAHAM BROS,
No. 2320 Frankford Avenue,
PHILADELPHIA, PA.
☞ SEND FOR OUR CATALOGUE. ☜

PATENTS.

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 *thirty-five years' experience*, and now have *unequaled 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, 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 reasonable terms.

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

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.

MUNN & CO., Solicitors of Patents,
37 Park Row, New York.

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

NEW YORK BELTING AND PACKING COMP'Y.

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

All other kinds Imitations and Inferior. Our name is stamped in full upon all our standard BELTING, PACKING, and HOSE.
Address NEW YORK BELTING AND PACKING CO.,
Emery Wheel. JOHN H. CHEEVER, Treas. NEW YORK.

MACHINERY

of every description. 121 Chambers and 103 Reade Sts., New York. THE GEORGE PLACE MACHINERY AGENCY.

FOR SECOND-HAND ENGINES,
Address HARRIS IRON WORKS, Titusville, Pa.

BARNES' PATENT FOOT POWER MACHINERY.
Complete outfits for actual Workshop business. Lathes, Saws, Formers, Mortisers, Tenoners, etc. Machines on Trial if desired. Mention this paper and send for Descriptive Catalogue and Price List.
W. F. & JOHN BARNES, Rockford, Ill.

$50 Per week. INTELLIGENT AGENTS can earn with the Walke Flexible Fountain Gold Pen. No dipping for Ink. Writes Four Days without re-filling. Only first-class men need apply. Address WALKE PEN M'F'G CO., Hamilton, Ohio, or 853 Broadway, New York.

THE WALLACE DIAMOND CARBONS.

Telegraph, Telephone, and Electric Light Supplies.

THE ELECTRICAL SUPPLY CO.,
109 Liberty St., New York.

DEAF PECK'S PATENT INVISIBLE EAR DRUMS, A Grand Success. Send for treatise. DR. PECK, 853 Broadway, New York. Also Prop. Dr. Stilson's Catarrh & Asthma Cures.

BATTERIES, WIRES, MAGNETS, INSTRUMENTS. TELEGRAPH AND ELECTRICAL SUPPLIES. CATALOGUE FREE. C. E. JONES & BRO., CINCINNATI, O.

DEAN BROTHERS,
Steam Pump Works,
INDIANAPOLIS, IND.,
Manufacturers of
BOILER FEEDERS AND PUMPING MACHINERY,
FOR ALL PURPOSES.
Send for new Illustrated Catalogue.

BEATTY'S ORGANS, 18 useful stops, 5 sets reeds, only $65. Pianos, $125 up. ☞ Illus. Catalogue FREE. Address BEATTY, Washington, N. J.

SUPERIOR SUBSTITUTE FOR WOOD ENGRAVING.
MOSS ENGRAVING CO.
INCORPORATED 1880. (MOSS'S NEW PROCESS.)
535 PEARL STREET, COR. ELM, NEW YORK.
Engravings of Portraits, Buildings, Landscapes, Machinery, Maps, Etc., for Newspapers, Books, Catalogues, Etc. Much cheaper than Wood Cuts.
THE LARGEST ESTABLISHMENT OF THE KIND IN THE WORLD.

50 BEAUTIFUL ALL NEW DESIGNS of Butterfly, Dragon-fly, Robin Redbreast, Pinks, Pansies, Violets, and Moss Rosebud Chromo Cards, name on, 10c. Card Mills, Northford, Ct.

To Electro-Platers.

BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with Books of Instruction for Gold, Silver, or Nickel Plating. THOMAS HALL, Manufacturing Electrician, 19 Bromfield Street, Boston, Mass. Illustrated Catalogue sent free.

WILLIAMSPORT Pony or Panel Planer. For general use in Door Shops, Box and Furniture Manufactories. For planing Door Panels, Cigar Box Stuff, and Furniture work, it has no equal.
We use the Ellis Patent three part Journal Box and a solid forged steel head. Two pressure bars. Has strong feed. Will plane from 1-16 to 6 inch thick. Weight, 1,600 lb. The lowest priced first class planer in the market. Send for illustrated catalogue and price list to ROWLEY & HERMANCE, Williamsport, Pa.

RUPTURE

cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.

Pond's Tools,

Engine Lathes, Planers, Drills, &c.
DAVID W. POND, Worcester, Mass.

$72 A WEEK. $12 a day at home easily made. Costly outfit free. Address TRUE & Co., Augusta, Me.

BIBB'S
Celebrated Original
BALTIMORE
FIRE-PLACE HEATERS
To warm upper and lower rooms. The handsomest, most economical Coal Stoves in the world.
B. C. BIBB & SON
Foundry Office and Salesrooms, 39 and 41 Light Street,
Baltimore, Md.
MARBLEIZED SLATE MANTELS.
☞ *Send for Circulars.*

PATENTS SOLD Partners Secured.
Joint Stock Companies formed. Stock placed for Incorporated Companies. Good investments always on hand. Highest references given. Circulars free. E. L. RICHARDS & CO., Brokers. 733 BROADWAY, New York.

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

"BLAKE'S CHALLENGE" ROCK BREAKER.

Patented November 18, 1879.

For Macadam Road making, Ballasting of Railroads, Crushing Ores, use of Iron Furnaces, etc. Rapidly superseding our *older styles* of Blake Crusher on account of its superior *strength, efficiency*, and *simplicity*. Adopted by important Railway and Mining Corporations, Cities, and Towns. First Class Medals of *Superiority* awarded by American Institute, 1879 and 1880.

BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

VENTILATING FAN for PASSENGER ELEVATORS. Patent for sale. Has been tested, and is in daily operation. Satisfactory testimonials of efficiency. Apply to LUKE DAVIS, care C. F. Hovey & Co., Boston, Mass.

OHIO STATE UNIVERSITY, Mechanical Department. The best place in the West to study Mechanical Engineering. Laboratory method. Shop practice. All modern advantages. Tuition free. Expenses very low. Address Prof. S. W. ROBINSON, Columbus, O.

WESTON DYNAMO-ELECTRIC MACHINE

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, BOYNTON & CO.; WM. 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; JOS. DIXON CRUCIBLE CO.; MUMFORD & HANSON; FAGAN & SON, and over 1,000 others. Outfits for NICKEL, SILVER, BRONZE, Plating, etc. The two highest CENTENNIAL AWARDS, and the CENTENNIAL GOLD MEDAL of American Institute, and Paris, 1878. Prices, $150 to $500.

HANSON & VAN WINKLE
SOLE AGENTS NEWARK, N. J.
New York Office, 92 and 94 Liberty St.
English Agency, 18 Caroline St., Birmingham, England.

PROFITABLE INVESTMENT.
A valuable water power, of sufficient force for any manufacturing purpose, together with a handsome tract of land and several buildings thereon, situate in Atlantic County, New Jersey, with direct communication by water to the ocean, and but five miles distant from the nearest railroad station, is for sale under very favorable conditions. Address A. STEPHANY,
Egg Harbor City, Atlantic County, N. J.

FORSTER'S CRUSHER AND CRUSHER AND PULVERIZER,

The simplest machine ever devised for the purpose.
We warrant 50 per cent. advantage in *Crushing*, with one-third power, and in combined Crushing and Pulverizing do the work of stamp and Burrs at one-third first cost. Can be *operated with any kind* of power.
Address TOTTEN & CO., Pittsburg, Pa.

BARREL, KEG, HOGSHEAD, AND STAVE MACHINERY.
Chamfering, Howeling, and Crozing. Fan and Stave Jointer.
Over 50 varieties manufactured by
E. & B. HOLMES,
Buffalo, N. Y.
Truss Hoop Driving. Head Rounding.

EUROPE.

Realizing Patents. Import of American goods into Europe. Representation on Exhibitions.
F. CAPITANIE, C.E., 178 Boul. Voltaire, Paris (France).

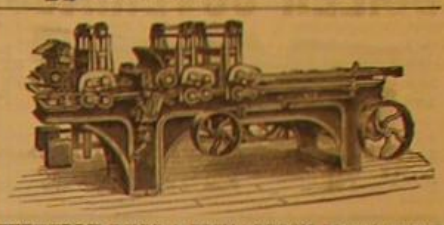
Cooper on the Use of Belting for the Transmission of Power. With plain, particular, and practical directions for the treatment, care, and management of belts. Demy octavo, cloth, $3.50.
E. CLAXTON & CO., 930 Market St., Philadelphia, Pa.

Pattern Making.—For good and quick work apply at 14 Library Ct., near Market St., Newark, N. J. R. Mudd.

FOR
HEAVY PUNCHES, SHEARS,
Boiler Shop Rolls,
Radial Drills, Etc.
SEND TO
HILLES & JONES
WILMINGTON, DEL.

ROOTS' NEW IRON BLOWER.

POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED
IS SIMPLER, AND HAS
FEWER PARTS THAN ANY OTHER BLOWER.
P. H. & F. M. ROOTS, Manuf'rs,
CONNERSVILLE, IND.
S. S. TOWNSEND, Gen. Agt., 6 Cortlandt St., 8 Dey Street,
WM. COOKE, Selling Agt., 6 Cortlandt Street,
JAS. BEGGS & CO., Selling Agts., 8 Dey Street,
} NEW YORK.
☞ SEND FOR PRICED CATALOGUE.



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

WANTED,
An energetic, practical, competent man as foreman in a large establishment manufacturing bent work. One who understands every detail of the business from the lumber to the finished goods, and who can handle men to advantage. None but first-class men with best of references need apply. Also men experienced in making Shafts, Poles, Bows, Hubs, and Spokes, to work in factory. Correspondence invited from competent, reliable men who want steady work at good wages.
Address T. CO., care *The Hub*, New York.

PATENT QUICK
Adjustable Stroke
SHAPERS
Can be Changed while in Motion.
E. GOULD & EBERHARDT,
NEWARK, N. J.

A SPLENDID CHANCE.
FOR SALE,
A manufacturing establishment, run by a good and durable water power—35 H. P. turbine—with saw mill, dwelling house, and barn, three acres of land, large factory filled with approved machinery; one mile from station, seventy miles from New York; freight low. Sold only on account of sickness of proprietor. Price $6,000; two-thirds can remain on property.
Address Box 671, Middletown, N. Y.

165 RACE ST. JAS. MURDOCK JR. CINCINNATI.
BRASS, COPPER, SILVER.
MACHINISTS SUPPLIES IN GERMAN SILVER.
SEND FOR WIRE, ROD, SHEET & TUBE IN THE THREE METALS PRICE LIST

Vient de paraitre: **CARTE des lignes d'egale declinaison magnetique construite pour l'epoque 1880,** .. par **ALEXIS de TILLO,** Colonel d'état-major Russe, membre de la Société Impériale Russe de Géographie. Avec le but de montrer la difference entre les cartes isogoniques de l'an 1880, des Admiraultés Allemande et Anglaise. **Chez Voss' Sortiment (G. Haessel) Leipzig. Prix 75 cts.**

SEND FOR CIRCULAR AND PRICE LIST OF
COPE & MAXWELL M'F'G CO'S
New and Improved Styles of
STEAM PUMPS
AND
BOILER FEEDERS
"The Best Made,"
Address HAMILTON, OHIO.

FOR SALE,
The entire Patent Right of a new and valuable Safety Extinguisher Lamp. No accident can occur from upsetting, falling, or careless handling. Must have a large sale where coal oil lamps are used. When introduced, for a person with some capital this is a chance for a fortune in a few years. For full information, address J. J. HENTZ, 104 South Charles St., Baltimore, Md.

JUST PUBLISHED.—Preparation and Use of
CEMENTS AND GLUE.
By JOHN PHIN. Sent by mail to any address for 25 cents. Send for our Catalogue of Practical Books.
INDUSTRIAL PUB. CO., 14 Dey Street, New York.

AUTOMATIC CABINET—PLAY ANY TUNE.
ORGANS ONLY **$5.**
Music, 4c. per foot. *Illustrated Catalogues Free.*
THEO. J. HARBACH, 809 Filbert St., Philadelphia, Pa.

CHEMISTRY FOR AMATEURS.—AN INteresting collection of experiments, illustrating some of the fundamental truths of chemistry, and requiring for their performance only the addition of a spirit lamp and a few test-tubes, illustrated with engravings showing—Reaction between nitric acid and iron; Experiment with Pharaoh's serpents; Formation of Crystals of Iodide of Cyanogen; Experiment with Ammoniacal Amalgam; Pyrophorus burning in contact with air; and mercury forming an amalgam with gold. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 239. Price 10 cents. To be had at this office and from all newsdealers.

SCIENTIFIC BOOKS bought, sold, exchanged, or published. BOOK INTERCHANGE, 23 So. 7th St., Phila.

50 All Gold, Chromo, and Lit'g Cards (No 2 alike) Name on, 10c. Clinton Bros., Clintonville, Conn.

NEW YORK STENCIL WORKS
STEEL LETTERS **STAMPS** STEEL DIES, &c.
87 NASSAU ST. N.Y.

PARTIES INTERESTED IN PATENTS relating to light hardware, who wish goods manufactured in quantity for the market, will find that we can furnish low estimates on all kinds of metallic goods.
GEO. VAN SANDS, Lock Drawer 132, Middletown, Ct.

$3 STARTS MALES OR FEMALES EVERYWHERE in an acceptable, respectable, permanent, independent occupation; profits, 100 per cent.; $1,000 to $5,000 per year can be made. Send for circular. MANAGER, 338 7th Ave., New York.

Advertisements.

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

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

Estab'd **EAGLE ANVILS.** 1843.

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

Double Screw, Parallel, Leg Vises.

Made and WARRANTED stronger than any other Vise by **FISHER & NORRIS** only, **Trenton, N. J.**

"1880" Lace Cutter. By mail, 50c. Discount to the trade. Sterling Elliott, 302 Dover St., Boston, Mass.

BOILER COVERINGS,

ASBESTOS-LINED, REMOVABLE.
THE PATENT AIR SPACE COVERINGS.
THE CHALMERS-SPENCE CO., Sole Proprietors,
10 Cortland St. Foot of East 9th St., New York.

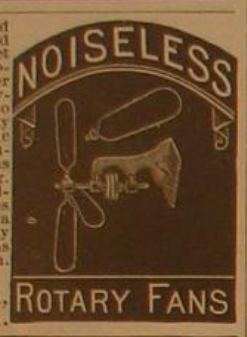
NEW YORK BELTING AND PACKING COMPANY, THE

OUR "TEST" HOSE

Is superior to anything ever before made. Every description of Rubber Hose always in stock.

37 & 38 PARK ROW, NEW YORK.

These fans can be fastened to ceiling or side wall, and driven by a round belt direct from a Backus Water Motor, Steam Engine, or other power. Blades can be covered with paper muslin to suit the taste in color. By changing angle of blade amount of air can be regulated. Two or more fans can be connected on ceiling. Shaft of fan runs in metalline journals, and requires no oiling, which is quite a consideration where they are put up in dining rooms over tables. Price $5 each.



Manufactured by
Backus Water Motor Co.,
323 Broadway, New York.

METHYL CHLORIDE,

As mentioned in SCI. AM. SUPPLEMENT, No. 239, for sale by D. & O., Box 1554, P. O., New York.

ENSILAGE POWER! Our 2-Horse Eureka Engine and Boiler is just the thing—SAFE, CONVENIENT, DURABLE.
B. W. PAYNE & SONS, Corning, N. Y.

Jenkins' Patent Packing and Valves.
"THE STANDARD."

Jenkins' Packing has *never failed* to make a perfect joint where directions were followed. Jenkins' Valves are warranted steam tight and are made of the best steam metal. JENKINS BROS., 71 John St., New York.

HOLCOMB'S NEW
Amplifying Telephones,
FOR PRIVATE LINES.

The latest and best. Patented April 26, 1881. These new instruments embody recent and important improvements. They transmit conversation, music, orders, etc., with almost electric speed and surprising fidelity. The only durable and reliable substitute for the Electric Telephones. Work two miles. Price $10 per set. Illustrated Circulars FREE.

HOLCOMB & CO.,
Mallet Creek, O.

[Mention this paper.]

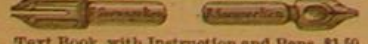
H.W. JOHNS' ASBESTOS LIQUID PAINTS,

ASBESTOS ROOFING,
ASBESTOS BOILER COVERINGS,
ASBESTOS LINING FELT,
ASBESTOS STEAM PACKING,
ASBESTOS WICK PACKING,
ASBESTOS FLAT PACKING,
ASBESTOS MILLBOARD,
ASBESTOS GASKETS,
ASBESTOS SHEATHINGS,
COATINGS, CEMENTS, Etc.

Descriptive price lists and samples sent free.

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

Round Writing
USEFUL FOR EVERYBODY



Text Book, with Instruction and Pens, $1.50.
KEUFFEL & ESSER, 127 Fulton St., New York.

THE PORTER-ALLEN High Speed Steam Engine.
ADDRESS
SOUTHWARK FOUNDRY & MACHINE CO.,
430 Washington Ave., Philadelphia, Pa.

WIRE ROPE

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

HOLDS INK FOR A WEEK'S USE. ANY GOOD INK MAY BE USED.

The Mackinnon IRIDIUM POINTED Pen or Fluid Pencil.

THE ONLY RESERVOIR PEN IN THE WORLD WITH A CIRCLE OF IRIDIUM AROUND THE POINT.
Always ready. Always with you. Cannot Blot. Cannot be worn out in a lifetime.
MACKINNON PEN CO., 192 BROADWAY, CORNER JOHN STREET, NEW YORK.
General Supply Depots in all principal cities in America and Europe.

Mill Stones and Corn Mills.

We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys, and Gearing specially adapted to Flour Mills. Send for catalogue.
J. T. NOYE & SONS, Buffalo, N. Y.

RAIL ROAD DEPOTS IRON BUILDINGS WHARF SHEDS
SUGAR HOUSES SELF FITTING COTTON STORES
PUBLIC MARKETS (CATALOGUES GRATIS) RETORT HOUSES
WALTER C. BERGIUS & CO—GLASGOW-SCOTLAND.

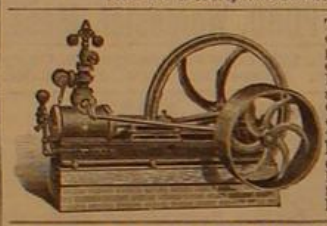
ERICSSON'S New Caloric Pumping Engine
FOR
DWELLINGS AND COUNTRY SEATS.

Simplest cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.

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

FOR BEST
COLD PENS.
Send for Price List to
JOHN HOLLAND, Mfr., 19 West 4th St., Cincinnati.

FRIEDMANN'S PATENT INJECTOR,
THE BEST
Boiler Feeder
IN THE WORLD.
Simple, Reliable, and Effective.
40,000 IN ACTUAL USE.
NATHAN & DREYFUS,
Sole Manufacturers, NEW YORK.
Send for Descriptive Catalogue



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

THE J. L. MOTT IRON WORKS,
88 and 90 Beekman St., New York.

Demarest's Patent Water Closets used almost exclusively in all fine work. Demarest's Water Closets, Latrine's and Hopper's for public buildings and factories. Mott's Celebrated Porcelain Lined Baths unequaled for beauty and cleanliness. Sanitary Goods of all kinds.

DIES FOR EVERY PURPOSE.
STILES & PARKER PRESS CO., Middletown, Ct.

SAWS 40,000 SAWS
EMERSON'S ILLUSTRATED SAWYERS HAND BOOKS (FREE) TO ANY PART OF THE WORLD.
THE SAW PLANER SAW TOOTH 3 CENTS EACH
ADDRESS EMERSON, SMITH & CO. BEAVER FALLS, PA

Jarvis Furnace Co.

Patent Setting for Steam Boilers Burns Screenings and Slack Coal without Blast. No. 7 Oliver St., Boston; No. 92 Liberty St., New York; No. 709 Market St., St. Louis; No. 1 Second St., Baltimore.

ROOFING.

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.

BOOKWALTER ENGINE.

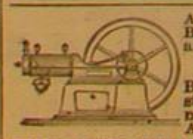
Compact, Substantial, Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of

3	HORSE POWER	$240 00
4½	" "	280 00
6½	" "	355 00
8½	" "	440 00

Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio,
or 110 Liberty St., New York.

WOOD-WORKING MACHINERY.

Universal Wood Workers, Planing, Matching, Moulding, Band and Scroll Sawing Machines, Carriage, Wagon and Wheel Machinery, etc.
BENTEL, MARCEDANT & CO.,
HAMILTON, OHIO, U. S. A.



An engine that works without Boiler. Always ready to be started and to give at once full power.
SAFETY. ECONOMY. CONVENIENCE.
Burns common Gas and Air. No steam, no coal, no ashes, no fires, no danger, no extra insurance. Almost no attendance.

THE NEW OTTO SILENT GAS ENGINE.

Useful for all work of small stationary steam engine. Built in sizes of ½, 1, and 7 H. P. by SCHLEICHER, SCHUMM & CO., 305 Chestnut Street, Phila., Pa. A. C. Manning, 35 Dey St., New York, Agent.

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

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

TO INVENTORS AND MANUFACTURERS

The Semi-Centennial Exhibition

Of the American Institute of the City of New York will open September 14, 1881. Heavy machinery will be received as early as August 22; other goods, September 5. Intending exhibitors must make early application to secure proper space and classification. For blanks and information address **General Superintendent American Institute**, New York City.

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

$66 a week in your own town. Terms and $5 outfit free. Address H. HALLETT & Co., Portland, Me.

SHAFTS PULLEYS HANGERS
At Low Prices. Large Assorted Stock.
A. & F. BROWN, 57-61 Lewis St., New York.

Geo. W. Read & Co.,
Manufacturers of and Dealers in
MAHOGANY,
And all Foreign and Domestic
Cabinet Woods.
SOLE MANUFACTURERS
CUT AND PRESS DRIED
THIN LUMBER,
FOR
CIGAR BOXES,
Panel Stock, Etc., Etc.

Mills and Warerooms:
186 to 200 Lewis St., New York.

PAYNE'S AUTOMATIC ENGINES.

Spark Arrester.

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

ICE AT $1.00 PER TON.
PICTET ARTIFICIAL ICE CO., Limited,
P. O. Box 3083. 142 Greenwich St., New York.
Guaranteed to be the most *efficient* and *economical of all* existing Ice and Cold Air Machines.

OLD RELIABLE.
NO FAILURE IN SIXTEEN YEARS
HEALD & MORRIS CENTRIFUGAL PUMPS
100 TO 35,000 GALLS PER MINUTE CAPACITY
HEALD & MORRIS, Baldwinsville N.Y.

THE SCOVILL "Pop" Safety Valve,
SIMPLE, RELIABLE, DURABLE.
For Locomotive, Stationary, Marine, and Portable Boilers.
Send for descriptive circulars and price lists to
THE HANCOCK INSPIRATOR CO.,
BOSTON, MASS.

$3 Press Prints envelopes, cards, etc. (Self-inker $4). Press for circulars, etc., $8. 12 other sizes. Do your own printing. Pleasure or money making; old or young. Everything easy; printed instructions. Catalogue of Presses, Type, Cards, etc., for two stamps.
Address Manufacturers, **Kelsey & Co., Meriden, Conn.**

THE
New York Ice Machine Company,
115 Broadway, New York, Room 78.
LOW PRESSURE BINARY ABSORPTION SYSTEM.
Machines Making
ICE AND COLD AIR.
Low Pressure when running. No pressure at rest. Machines guaranteed by C. H. Delamater & Co.

TO INVENTORS

THE
Howard Manufacturing Co.
(INCORPORATED,)
364 & 366 Broadway, New York.

Organized for the manufacture and introduction of
PATENTED NOVELTIES
AND
YANKEE NOTIONS,
OF EVERY DESCRIPTION.
AMPLE CAPITAL.
Latest Improved Machinery.
CONNECTIONS WITH ALL WHOLESALE MERCHANTS IN THE UNITED STATES AND CANADA.
Agents in Foreign Countries.
Correspondence without charge, with all who desire their inventions *in our line* developed.

PROSPECTUS
OF THE
Scientific American
FOR 1881.
The Most Popular Scientific Paper in the World.
VOLUME XLV. NEW SERIES.
COMMENCES JULY 1.

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.

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

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

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

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, 1 year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for 1 year. This includes postage, which we pay. Remit by postal order or draft to order of Munn & Co., 37 Park Row, New York.

PRINTING INKS.

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