Business and Personal

Marine Iron Works. Chicago. Catalogue free. "U. S." Metal Polish. Indianapolis. Samples free Yankee Notions. Waterbury Button Co., Waterb'y. Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell

Inventions developed and perfected. Designing machine work. Garvin Machine Co., 141 Varick St., N. The celebrated "Hornsby-Akroyd" Patent Safety Engine is built by the De La Vergne Refrigerating 2 chine Company. Foot of East 135th Street, New York The best book for electricians and beginners in e

tricity is "Experimental Science," by Geo. M. Hopki By mail, \$4. Munn & Co., publishers. 361 Broadway, N. Send for new and complete catalogue of Scient

and other Books for sale by Munn & Co., 361 Broadw New York. Free on application.



HINTS TO CORRESPONDENTS.

Names and Address must accompany all let

Names and Address must accompany all letter or no attention will be paid thereto. This is for o information and not for publication.

References to former articles or answers shour give date of paper and page or number of question and utilities not answered in reasonable time shour be repeated; correspondents will bear in mind the some answers require not a little research, and though we endeavor to reply to all other by letter in this department, each must take his turn.

Buyers wishing to purchase any article not advertise in our columns will be furnished with addresses houses manufacturing or carrying the same.

Special Written Information on matters personal rather than general interest cannot expected without remuneration.

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

Books referred to promptly supplied on receipt price.

price.

Minerals sent for examination should be distinct marked or labeled.

(8020) S. E. D. asks: What would be t proper lengths of the tubes mentioned in t SCIENTIFIC AMERICAN of November 24 for full set of chimes of ten notes? Will t full set of chimes of ten notes? tubes give as clear a tone as bells of t same pitch? A. The lengths cannet be give exactly on account of the variation in dia eter and thickness of the tubes. They can cut off a little longer than the length give and turned by filing the ends. We give lengths of fifteen tubes in inches: G. 11 A, 11; B, 10¼; C, 9½; D, 9½; E, 8½; 8½; G, 8½; A, 7½; B, 7¼; C, 6½; D, 6 E, 61/8; F, 51/4; G, 51/4. The tubes are 1/8 external diameter and 1-32 in. thick.

(8021) H. S. G. asks: Is water a conduc or or a non-conductor? A. Water is a no conductor of electricity. It has a very hi resistance when pure. The addition of a tra of an acid will, however, reduce the resista so that it will conduct fairly well. When the is \mathbf{d} one electrolysis takes place.

(8022) H. H. G. asks: Can you tell me I should shellac the plates of a Wimshurst n chine which I am constructing? I am mak the plates of hard rubber and they are eiginches in diameter. A. It is well to shell the plates of a Wimshurst machine, even if hard rubber, since the shellac prevents deposit of moisture from the air upon

INDEX OF INVENTION

For which Letters Patent of the United States were Issued for the Week Ending DECEMBER 25, 1900,

AND EACH BEARING THAT DAT

[See note at endoflist about copies of these paten

Abdominal support, H. S. Gates	004 200
Accumulator, L. Renaud	004,398
Advantiging device electric D. Dewgen	004,679
Advertising device, electric, P. Dawson Aging apparatus, wine or liquor, A. B. C.	661,807
Dowdell	664.538
Air-compressors, unloading means for, G.	004,600
Ant-compressors, unloading means for, G.	004 500
de Laval and G. P. Aborn, 664, 562,	664,363
Air cooling and agitating apparatus, E. F. Porter	004.550
Alarm. See cord-tension alarm. Low-	664,776
Alarm. See cord-tension alarm. Low-	
water alarm.	
Amalgamator, grading, A. Z. Baldenebro	664,712
Anchor-rope attachment, boat, C. C. Freer	664,738
Ash-pan, W. S. Anderson	664,708
Auger, earth, W. B. Gibson	664,741
Automobiles, combined condenser and dash-	
Automobiles, combined condenser and dash- board for, L. F. N. Baldwin	.664.373
Axle, J. H. Taylor	664,447
Axle and box, vehicle, J. G. Anderson	
Axle for automobiles, steering, J. B. Deck-	.,01,011
er	661 790
er	661 740
Bag. See salve bag. Bag-holde Hicks and P. L. Hoff-	004,149
Dog holds Higher and D I Hoff	
man 'HCKS and I. L. Hon-	001 100
Polonos en la Timina	664,409
Doling prov	664,734
Paling press.	664,423
banng-press, C & Santa College	664,701
Barrel-carrier, S. Land Harrier	664,623
Darreis when steam of his se-	001 ==0
curing, F. E. Jewe	664,556
Basket, W. T. and J. I. Is and	384,654
Bearing, antifriction roller, J. A. R. Kills	1. 322
Bag-hold Hicks and P. L. Hoffman Balance as f. Frickson Baling-press, S. Harbert Barrels when steam and the curing F. E. Jewell Basket, W. T. and J. I. I. I. Bearing, antifriction roller, J. S. Bearing for colter or other six and lubricating and dust-proof. W.	
lubricating and dust-proof, 1, v.	
Coombs and L. A. Brooks	1365
lubricating and dust-proof, 1. W. Coombs and L. A. Brooks	A 44
Bearings, closing-up device for axle, F.	
Surth	664, 11
Bed-bottom, spring, W. D. Hunt	664,756
Surth Bed-bottom, spring, W. D. Hunt Bed, folding, D. Eisner	664,539
Bedclothes-holder, M. S. Parsons	664,496
Beer, etc., cold-air-pressure apparatus for,	001,100
G. Schmidt	664,824
Beet-topping-machine, J. H. Luhrs	664, 120
Bench. See washbench.	10 1. 120
Bicycle, H. C. Weeks	661 996
Pievela chein A I Teche	004,826
Bicycle-chain, A. I. Jacobs	004,481
Dilliand one I Duarons	064,490
Billiard-cue, J. Brauers	664,528
Dinder, automatic lock, F. A. Trussell	664,825
Blind, Outside Window, W. Afford	664,451

ı.	Boat, life, E. A. Manny Boiler. See water-tube boiler. Boiler, T. P. Connelly.	664,769 664,534
	Boat, life, E. A. Manny Boiler. See water-tube boiler. Boiler, T. P. Connelly. Boiler furnace, steam, C. W. Fleischmann and K. Fischer. Bookes, sectional, C. Snyder. Book, manifolding order, S. S. Cooke. Book, marifolding order, T. T. Montgomery Book or copy holder, B. T. Montgomery Book or music rack attachment, W. A. Luby	664,473 664,687 664,384
, Ct. St.,	Book or copy holder, B. T. Montgomery Book or music rack attachment, W. A. Luby Rook separable, F. H. Gilson	664,417 664,664 664,419 664,544
and I. Y. Oil	Luby Book, separable, F. H. Gilson Bottle, W. A. Fries, Sr. Bottle, non-refilable, J. H. Barnes. Bottle, non-refilable, H. J. Bloomer Bottle, water, W. B. Fenn. Box. See butter-box. Mail-box. Match-box. Paper box. Ticket-box. Box.core huddingstrin W. J. Pierrout	664,544 664,739 664,376 664,605 664,472
Ma- k. elec-	Box. See butter-box. Mail-box. Match-box. Paper box. Ticket-box. Box-corner binding-strip, W. J. Pierpont Box-fastener, H. C. Knox	664,676 664,415
ins. I.Y.		664,471 664,711
way,	Broaching-press, J. A. Baker. Bucket, minnow, J. R. Brinck. Burner. See gas-burner. Butter-box. J. K. C. Hobbs.	664,615 664,719 664,549
1	enswick Frake. See back-pedaling vehicle-brake. Brick loading or uncoading apparatus, T. E. Ayotte and A. A. Charbonneau Broaching-press, J. A. Baker Bucket, minnow, J. R. Brinck. Burner. See gas-burner. Butter-box, J. K. C. Holbbs. Buttonhole marker and spacer, G. A. Joy. Cabinet, buffet, T. G. Walpuski. Call-box, electric, E. E. Salisbury. Camera, roll-holding photographic, J. P. Meyer Can. See oil-can. Sliver-can.	664,759 664,697 664,681
,	Meyer Can. See oil-can. Sliver-can. Canceling machine, letter, S. E. Pettee Capsules for bottles, etc., machine for man-	664,429
ters	Camera, roll-holding photographic, J. P. Meyer Can. See oil-can. Sliver-can. Canceling machine, letter, S. E. Pettee. Capsules for bottles, etc., machine for manufacturing, E. Watzke. Car construction, railway, J. H. Horne. Car-coupling, S. P. Bush. Car, double-hopper-bottom, G. I. King. Car, flat, G. I. King. Car grain-door, A. T. Bramer. Car or wagon stake, G. H. Wall. Car-roof, H. W. Beimdiek, Jr. Carbureter, J. F. Bennett. Carcasses, apparatus for handling animal, W. C. Jarvis. Card-holder, J. D. Kelly. Card-holder, J. D. Kelly. Carpet-cleaner, W. and J. Bowie. Carrier, See barrel-carrier.	664,516 664,552 664,608 664,760 664,646
our ould ion.	Car grain-door, A. T. Bramer. Car or wagon stake, G. H. Wall. Car-roof, H. W. Beimdiek, Jr Carbureter, J. F. Bennett.	664,716 664,793 664,602 664,457
ould that and, etter	Carcasses, apparatus for handling animal, W. C. Jarvis	664,410 664,558 664,753 664,606
ised s of	Cart, J. J. McNultv	664,666
of be	Casket-lowering device, A. C. Richardson. Casting, composite metal, W. D. Sargent. Castor-bean-popping house, C. Saxton Chairs, playing board and guard for infants, E. Eighebare.	664,581 664,438 664,586 664,542
ot of	E. Firnhaber. Chart, adjustable dress, H. C. Wilson. Chuck, planer, J. Suess. Church or altar safety apparatus, D. G. Finnerty	664,700 664,688 664,541
the	Clamp. See saw-clamp. Umbrella-rod clamp. Clamp or bracket, B. F. Durham	664,390
the ra the	Simpson Clasp for shoes, etc., S. Cohen Cleaner. See carpet-cleaner. Clip. See hame-clip.	664,467
the ven am-	Clock striking mechanism, J. Gutekunst Clothes-line reel, H. Huebner Clutch, E. Prouty.	664,517 664,404 664,640 664,431 664,462
be ven the	Cock, stop and waste, J. B. Campbell Coin-controlled mechanism, R. E. Monger Collar-pad fastener, J. E. Chantler Collar-spring, S. A. Koltonski	664,463 664,569 664,464 664,648
½; F, ½;	Collector-ring, H. G. Reist	664,497 664,427 664,643
In.	Cord-tension alarm, C. Bransgrove	664,537 664,717 664,627
ict- ion- igh	Cornet, F. J. Richmand. Corset-shield, P. M. Matthew. Coupling. See car-coupling. Thill-coupling. Cows from kicking, device for preventing,	664,434 664,659
nce this	Clip or card-holder, F. S. Webb. Clock striking incehanism, J. Gutekunst. Clothes-line reel, H. Huebner. Clutch, E. Prouty. Cock, lock, J. B. Campbell. Cock, stop and waste, J. B. Campbell. Cock, stop and waste, J. B. Campbell. Colin-controlled mechanism, R. E. Monger. Collar-pand fastener, J. E. Chantler. Collar-spring, S. A. Koltonski. Collector-ring, H. G. Reist. Compass attachment, S. D. Patrick. Conveying apparatus, S. B. Peck. Cop-tube mandrel, D. Jackson. Cop-tube mandrel, D. Jackson. Copter, extracting, J. Dourlas. Cord-tension alarm, C. Bransgrove. Corn-cutter, C. O. Eberlein. Corn husker and shredder, F. M. Teeguarden and J. B. Himes. Cornet, F. J. Richmand. Corset-shield, P. M. Matthew. Coupling. See car-cotoling, Thill-coupling. Cows from kicking, device for preventing, J. F. Wallace. Crate, ax-handle, H. G. Graves. Cuff-holder, P. O'Donnell. Cultivator and harrow, M. Smith. Cultivator replanter attachment, M. G. Mitchell Cultivator replanter attachment, M. G. Cultivator replanter attachment, M. G.	664,794 664,475 664,577 664,686
e if	Cultivator, hall, J. H. Aduceson. Cultivator replanter attachment, M. G. Mitchell Cultivator-shovel. F. W. French. Curtain, adjustable storm, F. P. Stukey. Curtain fixture. J. B. Bernier. Cut-off, down-spout, G. A. Higgins.	664,663 664,397 664,792
ing ght llac	Cylinder-tooth, P. Swenson	664,618 664,548 664,446
of the the	Delivery mechanism, O. Roesen. Distilling and refining oils, T. Macalnine Dock, sectional floating construction, W. Jamieson Door, grain, J. E. Brown and H. H. Win-	664,585 664,813 664,758
_	tera	664,621 664,727 664.628
NS	Uratting and measuring tool, combined, W. C. Day Dredging apparatus, F. Ecaubert. Driving mechanism, H. P. Richards Dye and making same, triphenylmethane, H. R. Vidal. Edwing device, J. P. Brown. Egg beater and mixer, combined, R. G. and E. H. Rabiger.	664,505 664,450 664,530
	Electric currents into effective mechanical	664,779
г Е.	energy, converting the energy of alternating, R. Eickenewer	664,511 664,371
ts.]	Electric machine, dynamo, I. Fisher Electromagnet-coil, S. D. Sprong Elliptic spring. O. Morrill and H. P. Wells.	664,396 664,442 664.571
,398 ,679 ,807	Engine. See internal-combustion engine. Rotary engine. Steam-engine.	664,498 664,453
,563 ,776	Trumble	664,510 664,589 664,599
,712 ,738	Engine speed-regulator, explosive, H. Sutton Engine tender, traction, F. J. Weir. Engines, incandescent igniting device for explosion, G. Miari and F. Giusti Envelon, J. F. Long Envelon, J. A. Ullman. Exhibiting device, B. Tropp. Faucet and overflow, combined, W. G. Wuichet Feather quills, machine for grinding, S. Levy Feed-water-purifying apparatus, J. S. Mc-	664,661 664,566 664,694
,7 08 ,741 ,373 ,447 ,611	Faucet and overflow, combined, W. G. Wuichet Feather quills, machine for grinding, S. Levy	664,803 664,564
,611 1,729 1,749	Dougall	664,572
,409 ,734 ,423	Feeder, boiler, J. Barry and M. L. Shaughnessy Feeder, steam-boiler, G. W. Vidhund Feeding and watering poultry, device for, D. E. Southwick Fender. See fireplace-fender. Fertilizer-distributer, J. C. Holtzclaw File, L. C. McNeal	664,6.36 664,591
,701 ,623	File, L. C. McNeal. File, prescription, H. I. Jeffers. File suspension device, document, D. E. Hunter Filter, I. C. Henderser Filtering material Filtering material Filtering material	664,477 664,573 664,482
1,654 1,322	irm t with Weeller	004,020
i, 15 i, 756	J. able wall, floor,	664 658
1,756 1,539 1,496 1,824	sure motor W. E. Simpson	664,786 664,787 664,449
4. 120 1,826 1,481	mechanism, O. Roesen. linder, O. Roesen. 2. See watering-fountain. ttomatic, C. E. Perry.	664.583 664,584 664,499
1,490 1,528 1,825 1,4 51	See boiler-furnace. Regenerative cht-furnace. Smokeless furnace. idlary furnace. L. Peslin.	



Pipefitters!

Your kit is not complete unless it includes the famous STILLSON WRENCH

which is particularly adapted for turning out the best work without crushing the pipe in the least. All parts are drop-forged. Once tried, it is always used. It has many imitations but no equals. See explanatory cuts Price list on application to

Price list on application to WALWORTH MANUFACTURING CO., 128 TO 136 FEDERAL ST., BOSTON, MASS. Whether cheap or costly, common or uncommon, belonging to every trade and profession, is exhaustively described and accurately illustrated in



thenew, improved and revised edition for 1900. Printed from new type, with hundreds of new pictures and explanations of the latest Tools manufactured for every known purpose. A book that all should have for reference and study. By mail for 25 cents.

MONTGOMERY & CO., 105 Fulton St., New York City.

THE EUREKA CLIP

The most useful article ever invented for the purpose. Indispensable to Lawyers. Editors, Students, Bankers, Insurance Companies and business men generally. Book marker and paper clip. Does not mutilate the paper. Can be used repeatedly. In Doxes of 100 for 25c. To be had of all booksellers, stationers and notion dealers, or by mail on receipt of price. Sample card, by mail, free. Manufactured by Consolidated Safety Pin Co., Box 21, Bloomfield, N. J.





\$5 PRESS Circular or Small Newspaper Press \$18. Typesetting easy. Money maker or saver, Send stamp for catalogue, presses, type, paper, etc. THE PRESS CO., Meriden, Conn.

CASTINGS; Both GREY IRON and BRASS. PATTERNS: WOOD and METAL, made from drawings and blue prints.

We manufacture castings and specialties of every description and weight and can build your patterns, if necessary, having a full equipped metal and wood pattern shon for this purpose. Send us your inquiries. Prices right.

WEST SIDE FOUNDRY CO., TROY, NEW YORK.



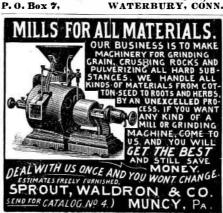
REEVES PULLEY CO. COLUMBUS. IND., U, S. A. BICYCLES Send for Our CATALOGUE MR. DEALER, it will PAY YOU to Write us.

** Send for handsomely illustrated atalogue "S. A." free.

OTTO KONICSLOW, CLEVELAND, OHIO. Automatic Machines FORMING WIRE C) from coil into shapes similar chines of goods, chroulars.

BLAKE & JOHNSON, WATERBURY, CO. to cuts. We can furnish machines or goods, as desired.

Send for Circulars.

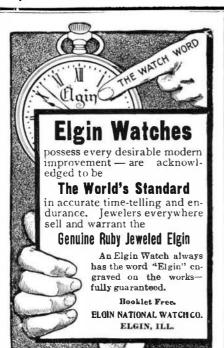


Furnaces, rate, W. R. Wood.

Cameraces, appllance for supplying air to, J., Sr., and J. Vicars, Jr.

Game and garder of the for playing same, and garder of the property of the color of th

(Continued on page 14)



Economical Gas Engine Igniters



of every description for Stationary, Marine or Automobile Engines, Dynamos, Magnetos, Dynamos, Magnetos, Starters, Coils and Plugs for either touch or jump spark. Dayton Electrical Mfg. Co., 80 St. Clair St., Dayton, O.



FOR FINE WORK

No machine on the market can equal our No. 00 H and Bench Milling Machine with two speed counter. Spindles and bearings of hardened and round tool steel, Aranged at the same size chucks and other attachments as fit mouth of bench lathe spindle. Traverse movement of table 7 inches. Fuller description in free illustrated booklet.

The Pratt & Whitter Co., Bartford, Cons.

GRAND PRIX, PARIS, 1900.



THE SANITARY STILL

on your kitchen stove furnishes plenty of distilled aerated water at trifling cost. Simple as a tea kettle. Mrs. JULIA DENT GRANT, widow of the famous General writes: "I have used your Sanitary Still and am very much pleased with it. The water from Still is pure and palatable." The Sanitary Still used in the WHITE HOUSE. Highest award at Paris Exposition.

CUPRIGRAPH CO.,
Write for booklet. 138 N. Green Street, Chie

American Sheet Steel Company Battery Park Building New York Manufacturers of all varieties of Iron and Steel Sheets Black and Galvanized Plain and Painted Flat, Corrugated and "V" Crimped

Apollo Best Bloom Galvanized Sheets W. Dewees Wood Company's Planished Iron W. Dewees Wood Company's Refined Iron Wellsville Polished Steel Sheets



\$50 A Week And Expenses Made By Live Agents Selling

THE ACORN LAMP

MAKES ITS OWN GAS At a Cost of One Cent for Ten Hours

Gives Setter and Brighter Light Than Electricity. Absolutely safe. No smell, no trouble. Indorsed and approved by Fire Insurance Underwriters. Made in 25 different styles. Prices from \$4.00 up. They sell on sight to stores and families. Guaranteed to give satisfaction. We have agents who arcselling 10 to 20 lamps per day. It's a wonder. Cataloguefree. Write





automatically and perfectly controlled. Send for the Wooden Hen Book;

mailed free, together with a book about the EXCELSIOR INCUBATOR, to those who name this paper GEO H. STAHL, Quincy, Illinois

Propelling mechanism, beat, J. H. D. Gerken 664,543
Pump, W. F. Singer 664,507
Pump-governer, R. Conrader 664,408
Punch, die, G. C. Ainswerth 664,408
Punch, die, G. C. Ainswerth 664,622
Push-butten, electric, T. A. Nathans 664,627
Pyrometer, H. ven Keehring 664,622
Railway aere-electric brake, C. Luyers 664,620
Railway aere-electric brake, C. Luyers 664,621
Railway electric safety appliance, E. L.
Orcutt 64,819
Railway-freg, J. Barry 664,819
Railway-switch, F. S. Pearsen 664,671
Railway-switch, automatic, W. W. Hoffman and F. W. Powers 664,671
Railway-switch, automatic, W. W. Hoffman and F. W. Powers 664,750
Railway-tie, metallic, R. O. Southworth 664,780
Railway-tre, metallic, R. O. Southworth 664,780
Railway-tre, combined, W. H. Smith, 664,780
Railway-tre, combined, W. H. Smith, 664,780
Railway-tre, combined, W. H. Smith, 664,780
Record and index, card, J. H. Rand 664,780
Record and index, card, J. H. Rand 664,780
Refrigerating or ice-making machines, regenerating and filtering apparatus for sait solutions in, G. Døderlein 664,501
Regenerative hearth-furnace, E. Blass 664,501
Regenerative hearth-furnace, E. Blass 664,522
Rein, safety, O. M. Whitman 664,538
Rendering apparatus, S. H. Brown 644,720
Rice hulling and cleaning machine, J. C. Clark 644,730
Riveting apparatus, S. H. Brown 644,733
Riveting apparatus, S. H. Brown 644,733
Riveting apparatus, S. Deumatic, J. J. Tynan and H. C. Mostiller 644,596

Regenerater, J. H. Mann.

Regenerative hearth-furnace, E. Blass.

Redein, safety, O. M. Whitman.

Gei. Se Reine, safety, O. M. Whitman.

Gei. Se Reine, safety, O. M. Whitman.

Gei. Se Reine, safety, O. M. Whitman.

Gei. Se Reinering apparatus, S. H. Brewn.

Gei. Se Reinering apparatus, S. H. Brewn.

and H. C. Mestiller.

Gelling-mill, J. Kennedy.

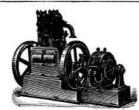
Relling-mill, J. Kennedy.

Gel. Se Gei. Se Gei.

Tiling, marble, etc., prepared for having fittings, etc., secured thereto, F. Lambert
Tire, armored pneumatic, A. H. Lewis. 624,762
Tire, armored pneumatic, A. H. Lewis. 624,762
Tire-retaining band, rubber, E. A. Hill. 624,748
Tire-retaining band, rubber, E. A. Hill. 624,748
Tre-tightener, L. M. Richardsen. 624,502
Trobacco-stemming machine, M. C. Baughan 624,714
Tobacco-stemming machine, A. T. Drysdale 624,328
Triped, P. H. Rearden. 624,502
Trelley, everhead electric, J. H. Brewn and W. H. Tobin, Jr. 624,459
Tubing, mechanism er apparatus fer bending, W. W. McCallum. 624,771
Turn-table, E. Burr. 624,460
Twine, machine for making grass, J. Lattyer, J. Scheeler. 624,587
Type-writer, G. W. Landen 624,837
Type-writer, E. Sensburg. 624,500
Umbrella-belder, F. Weitman 624,500
Umbrella-ved clamp, A. G. Snell. 634,500
Umbrella-ved clamp, A. G. Snell. 634,500
Umbrella-ved clamp, A. G. Snell. 634,483
Valve, air, T. Wheatley. 624,580
Valve, air, T. Wheatley. 624,580
Valve, air, T. Wheatley. 624,580
Valve, ari, T. Wheatley. 624,580
Valve, reducing, J. B. Waring. 624,553
Valve, steam-engine exhaust, E. Hughes 624,553
Vaperizing apparatus, A. Kitson. 624,762 664,710 664,483 664,469 664,809

Valve, steam-engine exhaust, E. F.
Hughes
Vaperizing apparatus, A. Kitsen.
Vaults, ferming grave, D. E. Aunkst and
W. H. Lawrence.
Vehicle, J. Klevstad and G. W. Jensen.
Vehicle-brake, J. R. Yeung.
Vehicle-frame joint, J. S. Copeland.
Vehicle gearing, meter, G. P. Derris.
Vehicle meter, F. B. Hepewell.
Vehicle running-gear, S. M. Mørden.
Vehicle-wheel, H. Kinney and J. O. Hankins venicle-wheel, H. Kinney and J. O. Han-kins
Vending-machine, R. E. Mønger.
Vielin-suppert, C. W. Brewster.
Wagon-body, A. G. Anderson.
Wagon er carriage runner, F. G. and G. L.
Scett Wagon, weighing chute, C. Bernhardt..... Washbench and rack, combined, C. B. Martin
Washing-machine, D. W. Bewman
Washing-machine, D. W. Bewman
Water-closet H. H. Kendrick.
Water-closet attachment, E. J. Healy, Jr.
Water, deaerating, G. M. Kleucker.
Water-heater, F. Schifferle.
Water-tube beiler, R. M. Head.
Water-wheel, turbine, F. Ellicott. 664,391,
Watering feuntain, automatic stock, J. R.
Beeman and F. H. Schmidt.
Way sealine, H. A. Hurches. 664,524 Beeman and F. H. Schmidt.
Wax, sealing, H. A. Hughes.
Weaner, calf or celt, A. N. Goff.
Weather-strip, O. G. Attkisson.
Weaving rectangular-meshed netting, machine for, H. A. Rendall and W. G.
Ackerman

(Continued on page 15)



WALRATH CAS & CASOLINE

From 4 to 200 H. P. Made in one, two, three and four cylinder type. The gas engine that holds a volt meter as close as an automatic stea mengine. Adapted to all power purposes, stationary or portable, and especially well qualified for electric lighting. Guaranteed to produce a first-class commercial light without the aid of countershafts or massive fly-wheels. Neat in design, simple in construction, economical in operation, self-lubricating, all parts interchangeable and accessible. Send for catalog "S."

Marinette Iron Works Mfg. Co., Marinette, Wis., U. S. A. G. F. Wheeler, General Sales Agent, Chicago office, 301 Fisher B'ld'g.

NO GAS and GASOLINE ENGINES. 4 to 250 HIGHEST GRADE ENGINES FOR ALL POWER PURPOSES.

Largest Exclusive Gas Engine Factory in America.

Regines held in stock in principal cities for quick delivery.

SEND FOR OUR NEW ILLUSTRATED CATALOGUE 5.

FOOS GAS ENCINE CO., STATION A, SPRINGFIELD, O.

The Scientific American

PUBLICATIONS FOR 1901.

The prices of the different publications in the United States, Canada, and Mexico are as follows:

RATES BY MAIL.

Scientific American (weekly), one year. 5.00
Scientific American Supplement (weekly), one year, 5.00
Export Edition of the Scientific American (menthly) in Spanish and English,
Building Edition of the Scientific American (monthly), - 2.50

COMBINED RATES

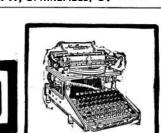
in the United States, Canada, and Mexico.
Scientific American and Supplement, - 7.00
Scientific American and Building Edition, - 5.00
Scientific American, Scientific American Supplement, and Building Edition, - 9.00

TERMS TO FOREIGN COUNTRIES. The yearly subscription prices of Scientific American publications to foreign countries are as follows:

U. S. English Money. Morey. £ s. d. - \$4.00 0 16 5 5 er. Scientific American (weekly), -Scientific American (weekly), - - \$4.00 | 0 16 5 5 Scientific American Supplement (weekly) | 6.00 1 4 8 Bullding Edition of the Scientific American (monthly), - - - - 3 00 0 12 4 Export Edition of the Scientific American (monthly) in Spanish and English | 3.00 0 12 4

COMBINED RATES TO FOREIGN COUNTRIES Scientific American and Supplement, - 8.50 1 14 11 Scientific American and Building Edition, - 6.50 1 6 9 tion. - 6.50 1 6.9 Scientific American, Scientific American Supplement, and Building Edition, 11.00 2 5.2

The above rates include postage, which we pay. Remit by postal or express money order, or draft to order of MUNN & CO., 361 Broadway, New York.



At the Front

In all new and scientific methods of construction, you will find the

New Century the foremost typewriter of the age-at the front in all improve-

It enables your operator to do more work with least fatigue, and makes correspondence a pleasure instead of a burden. Ask any New Century user about this and we will abide by the answer.

A splendid catalogue that you ought to see will be sent on request.

AMERICAN WRITING MACHINE CO., 302 BROADWAY, NEW YORK.

THE HARRISON CONVEYOR -Electric Light and Power Station Equipment, Industrial Railways. Screens, Roller Screens, Elevators, Hoisting Engines, Clam Shell Buckets, Breaker Rolls, Picking Tables, Howe Standard Scales, Howe Gas and Gasoline Engines. For catalogue and prices, address the manufacturers. BORDEN & SELLECK CO., 48-50 LAKE STREET, CHICAGO, ILL.

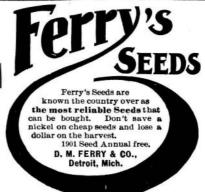
EFFREY CHAIN DREDGES THE JEFFREY MFG. CO. COLUMBUS, OHIO.

THE ORIGINAL AND GENUINE ::



Rubber Goods. Perfectly imitate linen. Are durable and keep white. They go to all parts of the Globe. Write for Catalog. We want Agents everywhere. M'f'd only by

Windsor Collar & Cuff Co.,



The No. 4 YOST WRITING MACHINE



be distinctive features of the Yost Machine, permanent alignment, direct inking, beautiful work, strength, simplicity, and durability are shown in perfection in the No. 4 Model.

Yost Writing Machine Co.

NEW YORK CITY.

LONDON, ENG.



FOR THE

GREATES AM I NEWSPAPER

with the most artistic pictures. Its correspondents and writers cover every important field the world over

LESLIE'S WEEKLY is a paper to keep on the library table, and to read and re-read, and to file away for useful reference. It is read by more families or culture and refinement among the masses than any other paper of its class in the world. It is the greatest, best, most attractive and cheapest of all American educators. Its special features are worth your time and money. They include Jasper's Weekly Hints to Money=Makers. 24swering without charge questions regarding Stock and Bond Investments; H. rmit's Life Insurance Suggestions, answering without charge questions concerning Life Insurance.

Send One Dollar to the publis iers' address below, and Leslie's will be mailed to you regularly each week for a period of four months.

110 FIFTH AYENUE

LESLIE'S WEEKLY **NEW YORK**

664.433

Planting Time



McCabe's Portable Electric Conveyor

For Loading Ships from Docks and Warehouses

For Loading Ships from Docks and Warehouses saving over 50 percent in time of loading. By means of this pertable ship and warehouse Conveyor, any sack or package cargo, that can be handled in a sling, can be put aboard ship as fast as it can be stowed and in an unbroken condition.

By means of this Electric Conveyor, flour, grain, sacked goods, etc., can be delivered at the hatch at the rare of 4,000 sacks per hour; and it does away with all staging and hoisting.

Correspondence with ship, wareheuse and stevedoring firms solicited, when photos and a full description of the invention will be forwarded.

Address Capt. W. L. McCABE, Stevedore, Taconna or Seattle, Washington.



Hawkins' New Catechism of Electricity for Engineers, Electricians, Wiremen and Amateurs, 550 pages 300 illustrations, bound in leather, pocketbook form, gold title and edges. Strictly Up-to-Date. Postpaid, \$2. f. Audel & Co.. 62 J vith Ave., N.Y.

A Cutter Milling Attachment



is indispensable for the proper execution of particular kinds of work. Our 8-inch Precision Lathe is fitted for this and Gear Cutting. No extra belts are required as the friction gear at end of feed rod takes the place of a belt and cone feed med allows the feed to slip in case of work jambing. Variation of feeds allowed by use of change gears of lathe.

FANEUIL WATCH TOOL CO., Brighton, Boston, Mass.

This Little Air Pump

will supply a 2-lb. blast to 4 blow-pipes, each burning 500 feet of gas in ten hours. Air nezzles to be 1-l6 inch opening. A strong blast and small air jet gives economy of gas consumption. This pump is also capable of pumping a 40-gal. tank to 40-lbs. pressure. Weight 30 Lbs. Price Only \$12.50 belivered to express company in Chicago, Send for Booklet.

S. COMSTOCK, Manufacturer 71 W. Jackson Blvd., Chicago, III.



Machines

Over 70 sizes and styles, for drilling either deep or shallow wells in any kind of soil or rock. Mounted on wheels or on sills. With engines or horse powers. Strong, simple and durable. Any mechanic can operate them easily. Send for catalog. WILLIAMS BROS., Ithaca, N. Y.

ARMSTRONG'S No. O THREADING MACHINE



Can be attached to bench or post. Designed for threading the smaller sizes of pipe, iron or brass, also bolts. Has two speeds, one for pipe 1½ to 2 inches, inclusive. Uses the regular Armstrong adjustable dies. Other attractive features. Send for particulars. The Armstrong Mfg. Co., 139 Centre Street, New York.

Queen Transits and Levels

High Grade Instruments with the Latest improvements. 160 page Engine ering THE QUEEN 240 page Mathematical Cata-Catalogue on application.

ENGINEERS' AND DRAFTSMEN'S SUPPLIES. QUEEN & CO., Optical and Scientific 59 Fifth Ave., New York. 1010 Chestnut St., Phila



KRÖMSKÖP Color Photography

Nature's Reflex! "It seems atmost a miracle!"
"To the already long list of marvelous devices which
will come into common every-day use must be added
this last and most pleasing sift of science."

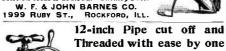
Kromskop's Kromograms and Kromskop's
Cameras, now ready.

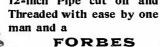
IVES KROMSKOP COMPANY, Incorporated 1324 Chestnut Street, Philadelphia.

WORK SHOPS

of Wood and Metal Workers, with-out steam power, equipped with BARNES' FOOT POWER

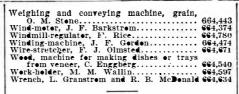
MACHINERY
allow lower bids on jobs, and give greater profit on the work. Machines sent on trial if de sired. Catalog Free.





PATENT DIE STOCK

Smaller sizes proportionately easy. Smal for Catalogue.
THE CURTIS & CURTIS CO.,
6 Garden Street. Bridgeport, Conn.



DESIGNS

DESIGNS.	
Ash-pan front, J. R. Carter and J. E. Haus-	
feld	33,798
Belt. L. M. Resenberg	33.810
Beiler section, steam, F. B. Hewell,	
33,784 to	33,786
Bex-blank, H. B. Smith	
Box lock and hinge fastener, G. B. Schmidt.	
Bracket, windew-shelf, J. E. Pewers	
Caddy, J. B. Long	
	33,788
Crayen-helder, F. D. Jones	
Display-stand, I. Steinau	
	33,809
	33,775
Furnace-frent, T. R. Kennedy and E. J.	00 =00
King	33,796
Gas-burner, R. H. White	33,794
Gasket or packing for joints of pipes or	
other apparatus, C. H. Merwarth and F.	
Compating C. C. M. E. Hartmann, 22.769	33,782

ctner apparatus, C. H. Merwarth and F. Cenlin Gem-setting, G. G. M. F. Hartmann. 33,782, 33,769 Hersesbee rubher cushien, M. Legan. 33,790 Hersesbees, metallic plate for elastic-tread, J. B. Gravis. 33,791 Leather fabric, C. D. Williams. 33,808 Legs, ankle member for artificial, G. W. Farrier. 33,773 Nail-set, J. Adkins. 33,793 Coven, warming, J. R. Carter and J. E. Hausfeld, S. R. Slaymaker. 33,779 Pest-base, R. T. Wood. 33,778 Nail-set, J. Adkins. 33,793 Sabretash, R. W. Owen. 33,793 Sabretash, R. W. Owen. 33,807 Shade-roller bracket, W. R. Maddern and E. H. Highee, Jr. 33,779 Shears member, D. C. Wheeler. 33,779 Shears member, D. C. Wheeler. 33,793 Steve-deer, J. R. Carter and J. E. Hausfeld. 33,793 Steve-deer, J. R. Carter and J. E. Hausfeld. 33,793 Steve-deer, J. R. Carter and J. E. Hausfeld. 33,793 Steve-deer, J. R. Carter and J. E. Hausfeld. 33,793 Steve-deer, J. R. Carter and J. E. Hausfeld. 33,793 Steve-deer, J. R. Carter and J. E. Hausfeld. 33,793 Steve-deer, J. R. Carter and J. E. Hausfeld. 33,793 Steve-deer, J. R. Carter and J. E. Hausfeld. 33,791 Steve-lamp G. Ebel. 33,791 feld Stove, lamp, G. Ebel. Stud or button for garment-supporters, D. Warner 33,7' 71. 33.772

TRADE MARKS.

Warner 33.771.
Telephone-receiver supporting-bracket, E. C.
Piexotte A. Sweet.
Tug-fastener, S. A. Mergan
Undergarment, G. O. Ceek.
Valve bex, step, A. H. Meiners.
Washbeard, S. R. Sargent.

35,66
35.64
•
35,66
35,64
35.63
35,63
35,65
35,67
35,63

Clippers, belt, H. K. Perter
Cocktails, T. H. Handy & Company.
Egg substitute, Ovine Company.
Eggs, desiccated and granulated, S. T. G.
Smith 35,672 35,649 35,658

LABELS.	
"Cyclo," for an extract, Vail Bros "Domino Bourbon Whisky," for whisky, Los Angeles Company	8,008 8,004
"F. Garcia & Bres.," for eigars, F. Garcia & Bres.	8,002
"Good Luck," for flavoring extracts, C. F. Sauer Company	8,000
"National Uniform Cap Co.," for caps, I. Levy	7,999
F. Sauer Company	8.001
"Perluxe," for a letion for the complexion, B. Levy & Company Robbin's Fat Consumer," for a medicine,	8,005
F. Robbin	8,007
Slusser Start Cure, 'Tor a gain cure, A. A. Slusser "The 20th Century Cigar,' for a cigar, Gei-	8,006
ger & Klein	8,003

PRINTS.

Reyal Seal," for cigars, W. E. Pfening..... 285

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York. Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, previded they are simple, at a cost of \$45 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

There is nothing so good in the way of a pen. Works, Camden. N. J. THE ESTERBROOK STEEL PEN CO. 26 John St., New York

MACHINES, Corliss Engines, Brewers' and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton Street, Milwaukee, Wis.

Expert Model Making. Established 1867. Wm. Trautman, Proprietor Chicago Model Works, Chicago, Ill. 179 E. Madison St. Write for catalogue of Model Supplies.

NOVELTIES & PATENTED ARTICLES Manufactured by Contract. Punching Dies, Special Ma-chinery. E. Konigslow & Bro., 181Seneca St., Cleveland, O.

Experimental & Model Work Cir. & advice free. Wm. Gardam & Son. 45-51 Rose St., N.Y.

GRINDING MILLS FOR ALL PURPOSES. Bogardus Patent Universal Eccentric Mill. Address J. S. & G. F. SIMPSON, 28 Rodney Street, Brooklyn, N. Y.

Magical Apparatus.

Grand End of Century Catalogue, just out,
over 100 engravings, 26c, Parlor Tricks Catalogue, free.
MARTINKA & CO. Mfrs., 493 Sixth Ave., New York.

VOLNEY W. MASON & CO., Friction Pulleys, Clutches & Elevators PROVIDENCE, R. I.

LEARN
TO WRITE
ADVERTISEMENTS

20 MINUTES a day in the study of advertising will fit you for \$25 to \$50 per week position. Employed gradates proveit. We teach every practical feature by mail. Write for cridence, free, PAGE-DAVIS CO. Suite 20, 167 Adams St. Chicago

MODEL, experimental, fine tool, or any class of work wanted by fully equipped factory, centrally located in New York City, expert mechanics, estimates given, correspondence solicited. MODELS, Box 773, New York.

AUTOMOBILE TRANSMISSION. Best variable speed device. Write for ca alogue
EMPIRE MOTOR WORKS,
898 Washington St., Buffalo, N. Y.



PALMER Stationary and Marine Gasoline En-gines and Launches, Motor Wagon Engines, Pumping Engines.

For Send for Catalog, MIANUS, CONN.

WANTED.—DRAFTSMEN. AN EXAMINATION of applicants will be beld at the Navy Yard, Nurfolk, Va. January 8, 1901, for one first-class ship draftsman at \$6.04 per diem and two second-class ship fraftsmen at \$4.00 per diem in the Department of Construction and Repair, Navy Yard, Norfolk, Va., and three second-class ship draftsmen at \$4.00 per diem and one thir 4-class ship draftsmen at \$3.28 perdiem in the of the of the U. S. Supt. Naval Constructor, Wm. R. Trigg Co. Richmond, Va. The examination will be open to all comers who can give evidence of experience in the kind of work for which they seek employment and who are citizens of the United States. Applications should be addressed to the Commandant, Navy Yard, Norfolk, Va., and must be delivere dto him on or before Monday, January 7. No application received after this date will be considered. Each applicant will state in his application his name, age, residence, present occupation, citizenship and previous occupation or work done. The applications will be accompanied by evidence of citizenship and by certificates, preferably from previous employers as to character, habits of industry and sobriety and skill and experience in work of the kind required.

JOHN D. LONG, Secretary of the Navy.

MODELS & EXPERIMENTAL WORK.
Inventions developed. Special Machinery.
E. V. BAILLARD, Fox Bidg., Franklin Square, New York.



BACKUS GAS AND ENGINE

Simple. Economical, Durable. Suitable for all kinds of work. Backus Water Motor, cheapest power known.

BACKUS WATER MOTOR CO., Newark, N. J., U. S. A.





TRADE MARKS
DESIGNS
COPYRIGHTS &C.

Anyone sending a sketch and description may quickly ascertain our opinion free whether an invention is probably patentable. Communications strictly confidential. HandbookonPatents sent free. Oldest agency for securing patents.
Patents taken through Munn & Co. receive special notice, without charge, in the

Scientific American.

A handsomely illustrated weekly. Largest cir-culation of any scientific journal. Terms. \$3 ayear; four months, \$1. Sold by all newsdealers.

MUNN & CO.361 Broadway, New York e. 625 F St.. Washington, D. C





FOR SALE.—Machine Shop, brass and iron foundry owners not active not large, but well equipped. Present owners not active nor conversant with the business. A thoroughly capable man who would know what and how to manufacture, with some capital, can buy this plant on very easy terms. Address WATERTOWN MFG. CO., Watertown, Wis.

Sendus your address and we will show you the locality where you live. Send us you raddress absolutely sure; we the locality where you live. Send us you rade, you work in explain the business fully, remember we guarantee aclear profit of \$3 for your day's week, absolutely save.

Wite at once

The Progress of Invention in the 19th Century

By EDWARD W. BYRN, A.M.

Large Octavo, 480 pages, 300 illustrations. Price \$3.00. Half red morocco, gilt top, \$4.00. By mail, postpaid, to any country in the world.



THE new volume, which worthily celebrates the close of the century, as far as the arts and sciences are concerned, has been met with the warmest praise by both reviewers and readers. The book is scholarly and interesting, and records and describes all the more important developments of the useful arts which characterize the period. In a chronological table mention is made of practically every great event during the century. An illustrated prospectus will be sent to any address on application.

The following are brief extracts from the many reviews, and give some idea of how the book has been received:

"THE ENGINEER" of London says, "In this volume, which is nicely printed and well gotten up, the author has attempted a heavy task and has carried it out in a praiseworthy fashion. There is hardly an invention or an improvement made during the century of which notice of some sort is not made."

"THE BROOKLYN EAGLE" says, "Every student who desires to be well informed on the subject of invention or to be familiar with the genius that has made the nineteenth the crown of the centuries, will be sure to want access to this volume. * * * 4 Mr. Byrn deals with his subject in a masterly manner."

"THE RAILWAY AND ENGINEERING REVIEW" says, "The book is well written and interesting, and presents in a creditable form the great scientific and engineering achievements of the century."

THE NEW BOOK BY E.W. BYRN

MUNN& Ca., Publishers

AMERICAN MACHINIST" says. "It gives rational descriptions of the principles of the fiventions included. Many, we fancy, who have been unable to keep up with the bewildering progress eligible of science in recent years as published by the periodical press will find here just the concise résumé of many recent discoveries that they need."

"THE RAILWAY AGE" says, "This review of inventions which have had their inception and development within the nineteenth century is very timely and appears to be a complete review of the subjects intended to be covered."

Every reader of the Scientific American should possess a copy of this unique and timely publication. MUNN & CO., Publishers, Scientific American Office, 361 B'way, New York.