(2309) W. G. S. writes: 1. Which is the right side to use tracing cloth with ink-the smooth or the dull side? A. Use the smooth side. 2. What remedy is there to prevent the ink from running? A. The ink should be thick, and the pen should be pressed

(2310) A. T. S. writes: 1. Please inform me what day of the week the 10th of September, 1853, 1854, 1855, 1856, and 1886 fell on? A. 1853 Saturday, 1854 Sunday, 1855 Monday, 1856 Wednesday, 1886 Friday, 2. What preparation do the skin doctors use to eradicate small scars from face and hands? A. Any number of cosmetics are recommended, but none can be given as a universal panacea. 3. Has the starch solution to be boiled for the iodine ink? How long will it take to fade? A. It should be boiled, and allowed to cool before adding the jodine. It is not very satisfactory, and its period of fading cannot be predicted.

(2311) T. E. P. asks what to add to crude gutta percha while dissolved, to make it stick to glass. I have had a great deal of trouble with it. A. To make gutta percha adhere to glass, apply heat after the solvent has completely evaporated. 2. Can I get zinc plates for a battery all ready amalgamated, from any electrical supply house? A. Amalgamated zincs may be had on special order, but they are very brittle and liable to break in transportation. You can amalgamate them without trouble by rubbing with mercury moistened with dilute acid. A piece of galvanized iron makes the best rubber for applying the mercury.

(2312) E. M. writes: Clay is principally discolored by oxide of iron. Would an electromagnet A. It can be done tentatively on basis of following do much to purify same, provided the clay in a liquid state could be repassed very close to the poles of same? A. A magnet will not attract sesquioxide of iron. It might purify clay from pyrites if the latter were of the The value of x it is evident must be 1, 2, 3 or 4. On magnetic variety. In our SUPPLEMENT, Nos. 340 and 383, you will find articles on the subject of treatment of clays.

(2313) T. J. L. asks: Can you inform me what will take a rust stain out of granite? I have - tried oxalic acid, but after seven or eight days the stain returns. A. Try the effect of hydrochloric acid after the oxalic acid has been applied,

(2314) W. H. S., Nebraska, says: A few weeks ago you gave an account in the Scientific AMERICAN of a Well somewhere in the East that at times gave forth a current of air. Our wells here are from two to three hundred, feet, deep, and at times the air comes so fast that it can be heard rods away, and at other times it sucks down. When the wind is north, the water rises five and six feet. When the wind is south, the water goes down. Our opinion is the rise and fall of the water is what causes the current. What I 12, cadmium 13. 2, Also the formula for Pharaoh's should like to have explained is, how can the wind serpents. A. See our SUPPLEMENT, No. 259. 3. The affect the water that depth under the ground? We are about one thousand miles from any body of water. A. The earth is porous, and contains air down to the water line. Changes of pressure in the atmosphere, a indicated by the barometer, must naturally be felt through the porous upper stratum and down to the water line. This, however, at the utmust, would only account for a small part of the variation in level which you speak of. The cause of so great a change of level must be considered as indeterminable in many cases. Often a special investigation will reveal it.

(2315) A. H. asks: 1. Can you give me the formula for a crystal cement for cementing glass that will not dim its brilliancy? A. Use Canada balsam or dammar varnish. 2. Is it possible to make everything perfectly horizontal? What I mean, suppose you aim a gun in a horizontal manner, does not that gun barrel describe the part of a circle of the same radius as the earth? A. Practically no, theoretically yes. In practice the departure from the horizontal is quite imperceptible. In the case of the gun barrel it would not describe a circle of the earth's radius, but would simply sagor bend downward an infinitesimal amount. 3. Can you give me the formula for making artificial ivory that will not dissolve in water? A. Mix 8 parts shellad with 32 parts strong ammonia and agitate for some hours in a closed vessel. After solution \mbox{mix} with it 40 parts zinc oxide in a paint mill. Expel ammonia by heating, dry, grind, and press into shape at a temperature of 500° to 540° Fah. We cannot answer the other queries.

(2316) W. J. P. asks (1) why a flash or stroke of lightning in the vicinity of a telegraph line will break the circuit on that line, causing the sounder to work by jerks, notwithstanding the same is held down by a strong battery of four cells. The undersigned, who is a constant reader of your paper, noticed the above phenomenon on a private line, with ground circuit, running from his house to that of a friend's a mile distant. A. When the lightning opposes the action of the batteries, it neutralizes the battery current and releases the armatures. 2. Is there any effectual means by which grass can be prevented from growing up be tween bricks in the pavement, or which will exterminate it after it has once grown up? A. A solution of common salt in water poured along the joints between the bricks will kill the grass. Chloride of lime is more powerful,

(2317) C. C. P. asks: 1. Can you give me a formula for modeling wax that will be a good substitute for clay? A. Mix thoroughly at as low a heat as possible 2 parts yellow beeswax, 41/2 ounces Venice turpentine, 2 ounces lard and 134 pounds elutriated bole (a fine ferruginous clay). Pour into a vessel with water and knead several times. 2. What produces the sound when one whistles? A says that the size of the opening at the lips produces the different tones. B says that the pitch is governed by the position of the tongue. as the tongue is low in the mouth when a low tone is made, and is raised correspondingly with the tone. Also a tone of the same pitch can be formed with a large and a small aperture of the lips. Have the vocal chords anything to do with it? A. The air rushing out through the lips produces a sound which is modified in pitch by the size of the cavity of the month. This acts as a resonator and re-enforces the particular note to which it corresponds. The vocal chords do not play any part in whistling.

(2318) W. H. Y. asks (1) how to make a dark cherry stain of good quality for staining scroll work, etc. A stain that will soak into the wood and not rub off and will take a good finish. A. You may use a suitable aniline color (diamond dye) after working the wood in a bath of Castile soap 31/2 parts in water 100 parts, or use a decoction of logwood in vinegar. 2. Also how to obtain a dark finish on oak and ash? A. Inclose in a box or closet with some saucers or plates of strong ammonia. The fumes will darken the wood.

(2319) C. A. asks: What substance could I use for a fire balloon? I have used a rag, a wick, and some sponge soaked in kerosene, turpentine, or alcohol. They all set my balloons on fire except alcohol, which is too expensive for a large balloon. A. Use paper. Soak the neck in a solution of alum. Surround the sponge with a tube a chimney of thin asbestos paper.

(2320) F. H. J. asks for a formula for gum and mode of applying to paper, as is used for gummed label paper. A. We have repeatedly published the postage stamp composition:

Water.....5 "

Or use a solution of gum arabic in water with a little glycerine. The proportion of the latter must be varied according to weather.

(2321) J. V. F. writes: Please give a solution of the following problem: A man buys 20 pencils for 20 cents. The prices are 4 cents apiece, 2 for a cent and 4 for a cent. How many of each did he get? equations:

$4x + \frac{1}{2}y + \frac{1}{4}z = 20$

trialit is found that x=3 gives an answer, when y=15and z=2, or 3 pencils at 4 cents, 15 pencils at 1/2 cent, and 2 pencils at 1/4 cent.

(2322) H. S. asks: Which chemical offers the most resistance to heat? A. Oxide of calcium (quicklime); of common substances, oxide of zirconium is probably as good a non-conductor as is

(2323) W. A. W. asks how to dissolve white shellac gum. Have tried alcohol, and while it softens the gum it will not dissolve it, but the same alcohol will dissolve orange shellac all right. A. The trouble is that the white shellac contains water. Use more and stronger alcohol.

(2324) W. J. asks (1) for alloy which will melt in hot tea. A. Tin 25 parts, lead 50, bismuth chemicals which are put in paper torpedoes. A, Fulminating powder, such as used in percussion caps.

TO INVENTORS,

An experience of forty years, and the preparation of more than one hundred thousand applications for palaws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices which are low, in accordance with the times and our ex ensive facilities for conducting the business MUNN & CO., office Scientific American, 361 Broad-

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

June 24. 1890.

AND EACH BEARING THAT DATE.

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

publications, attaching, J. D. Robertson..... 430,787

Addresses or labels to wrappers, envelopes, or

П	Alaum Cas Burnlar slamm Mill slamster slamm		
	Alarm. See Burglar alarm. Mill elevator alarm. Alkaline carbonates and acetone, making, F. W.	i	
	A. Frerichs	490 794	
1	Anchor, C. J. Whealton		
1	Animal shears, D. F. McDonald		
١.	Annunciator, R. P. Garsed		
1	Balge. De Young & Andrews.		
ŀ	Bale tie. L. R. Lantz		
٠l	Balling machine, sliver, G. J. Torrance		
ı	Band cutter and feeder, W. Holliday		
ľ	Band twister, G. H. Howe		
ı	Bar. See Harvester bar.	2. 701000	
	Barrel elevator, W. H. Pierson	431.000	
	Barrow wheel, J. P. Haigh		
1	Basin cover, catch. G. G. Campbell		
١I	Battery. See Diffusion battery. Galvanic bat-	100,020	
1	tery.		
۱.	Beam or girder, G. W. Dithridge	430 840	
ļ	Bed, invalid, D. T. Fox.		
•	Bed lounge, A. Morris.		
	Belt fastener, S. H. Morrall		
,	Bending machine, J. S. Stevenson		
١	Berth, ship's, D. F. McDonald		
,	Blind, stop, B. W. Hoxie		
	Blower, H. H. Barclay		
:	Boiler. See Feed boiler. Range boiler. Steam		
١.	boiler. Water tube boiler.		
•	Boiler, S. H. Jennings	430,856	
3	Boiler chambers or of flues, external wall of steam,	:	
•	H.C. Sellers	430,811	
3	Boiler-furnace, steam, Holmes & Sieben	430,955 i	
)	Boiler stays, making, G. L. McGregor	430,672	
ا و	Bolting reel, Cook & Gent	430,836	
3	Bolting reel, J. Swan	430,761	
1	Book support, J. Strippel	430,813	
7	Boots or shoes, combined metallic shank and		
	counter for, O. W. Easton.,,		
	Bottle, mucilage, E. R. Cahoone	430,619	
t	Box. See Letter box.	i	
•	Box ornamenting machine, T. Remus	450,883	
	Brake. See Car brake.	,	

<u> </u>
30,865 30,608
30,655
30,728
30,702 30,712
30,67.3 11,090 11,089
30,931 30,830
30,986
30,648 30,797 30,614
130,97 8 13 0 ,822 130,866
,87 3 3 0,8 26 3 0,82 7
130,613 130,952 130,683
,615 30,947 30,837
130,831 130,880
130,701 131.012
1 30, 99 0 1.30,915
130,821 130,640
43 0,807 130,853
130,610 130 ,8 1 9
430, 93 7 430, 6 97 430,759
450,943 130,899
130,936 430,7 9 9
430,649
430.972 430.627 430.611
430.731 430.834
430.726
430,657 430,847 430,618
430,962 430,769
431,02
430.7.€ 431.02
4∺0,72) 4:30,8†4
430,814
43 0,713 4 90 ,84 430,69
430,64
430,80 430,98 431,01
430,8% 430,8% 430,72
430.77 430,93 430,64
430,67 430,72 430,62
430,87
430.93 430.71
430.68 430.77 430.61
430,86 400.71 430,6
430,94 430,92 430,96
430.96 430,68
430,69 430,81
430,60 430,85 480,67
430.85

28	
Metal hollow ware, ornamenting, F. H. Webster 430,816 Metals by electricity, apparatus forworking, M.	Та Те
W. Dewey	Te Te
ing mill. Mill elevator alarm, Carter & McChesney	Те
Millstone dress, G. M. Snodgrass 430,893 Miner's tamp holder, W. C. Rockwell 430,691 Minnig machine cutter, E. E. Carter 430,99	Te Te
Would pin greasing machine, J. Krehbiel	Th
Moulding machine, sand, T. Mistelski	Til
Necktie pin, J. M. Guilbert	Tir Tir To
Numbering machine, paper, J. R. Carter (r)	То
Nut lock, Watson & Randolph 430,715 Ore roasting apparatus, J. R. Moffitt 430,741	Tr
Ore separator, magnetic, H. B. Smith	Tr. Tr
Padlock, D. M. Thomas	Tr Tr
Paper bag machine, W. B. Purvis	Tr
Graver 4:0,348 Paper making machine, S. S. Stevens 430,786 Pattern. See Founding pattern.	Tu Tu
Pegging jack, G. S. Dusenbery 430,732 Pepper grinder. J. C. Levi 430,661	Ту
Photographic camera, F. Whitney	Ту
Pin, J. Weil. 430,908 Pipe and nut wrench, combination, E. E. King 430,656 Pipe cutting machine, soil, Caleb & Couture 430,727	Ve Ve
Pipe hanger, G. W. Clark 4.00,623 Pipe hanger, E. Rutzler 431,010	Ve
Pipe wrench, E. O. Ely 430,994 Plow, N. Bellis 450,983 Plow, T. Bellis 430,983	Vi
Plow fender, W. W. Watson	Vı
ner	W
Post. See Fence post. Pot. See Chocolate pot. Press. See Copy press. Forging press. Fuel	w
press. Soap press. Press, Honaker, Jr., & Seiser	W
Pressure regulator, E. T. Winkler	W
Printing presses, etc., air cushioning apparatus for, R. Miehle 4.0,665 Propeller, steering, D. J. Reynolds 4.31,009	W
Pulverizing mill, V. L. Rice. 430,984 Pump, oil, Campbell & Pickett. 430,919	w
Rack. See Broom rack. Hay rack. Radiator, J. B. Dyar	w
Railway crossing, R. H. St. John 430.760 Railway, electric, W. Robinson 430,600 Railway joint, F. S. Foltz 430,839	w
Railway semaphore, J. W. Steele	w
Railway switch, C. Hager 430,801 Railway tie, H. W. Libbey 430,780	w
Railways, block signaling system for, M. S. Conly. 431,617 Railways, gear for driving the winding drums of cable, G. Leverich	w
Range boiler, G. Bejsovec	w
Refrigerator, J. Hammerl. 430,944 Refrigerator, E. P. Koontz. 430,943	w
Refuse treating apparatus, V. D. Anderson 430,795 Regulator. See Dynamo regulator. Pressure regulator. Temperature regulator.	
Roasting furnace, revolving, G. Duryee 430,929 Rod. See Fishing rod.	Al Bi
Roller and protector, combination, E. M. Turner. 430,902 Rolling mill, rod, I. A. Kilmer	Ca
Tellering. 430,977 Roof cleat, metal, J. L. Dickelman. 480,927	Ca Ei Gi
Root cutting machine, H. E. Staples et al. 4 :0.704 Sad iron, F. Long. 430,663	Oi Qi
Sad iron, M. Virnoche 4:0,714 Sap feeder and regulator, E. Minor 430,968 Sash balance, Fife & Bleha 430,938	R
Scale, automatic grain, M. B. Lloyd	St St
Screen. See Folding screen. Screwdriver, H. H. True	St
Screw shank and ferrule, J. Pymm	
ner	A
Sewing machine feed mechanism, R. Stephenson. 430,897 Sewing machines, cutting mechanism for button- hole, F. W. Ostrom	Ci
Shears. See Animal shears. Shears, R. S. Pearsall 430,677	C
Sheet metal shearing machine, L. K. & C. A. Williams	G G
Shoe fastener, C. F. Ziegler	H
Signal. See Railway signal. Signal and switch controlling apparatus and veri-	O
fying mechanism, automatic, E. R. Gill, Jr 430.6:7 Single or doubletree, W. Bing 430.765 Snap hook, H. E. Kelley 430.857	P
Soap press, F. S. Rutschman 4:0.8:8 Soldering apparatus can, D. D. Ranney 430,751	
Spectacle frame, sight testing, J. K. Underwood 430,763 Spout for cans, drop, G. W. Banker 430,820	
Spring. See Vehicle spring. Watch case spring. Square, folding Tr., H. W. Oliver	10
Stamp, hand, W. T. Cressler	10
Steam boiler, G. R. A. Steares 430.8% Steam engine, R. Phillips 430,681	S
Steamer and drier for mills, grain, G. L. Jarrett. 430,652 Stenographer's stand, G. C. Logan	S
Store service apparatus, C. W. McCormick	Т
Stove, Clark & Collins	ī
Stove for consuming straw, hay, etc., J. Ash- worth	
Strap clamp, W. S. Sherd 450,891 Straw stacker, A. Lammedee 440,863	ti a
Strength fester, coin-controlled, G. Soeding 431,013 Supporter. See Garment supporter.	C
Switch. See Locomotive switch. Railway	ir g

Table. See Folding table Tank heater, S. Wilks

			C I
6	Tap or vaive, Rigg & Meacock	630,689	-
۱,	Telegraph, district police and fire, C. C. Drake	43 0.992	
9	Telephone exchange, apparatus, J. J. O'Connell		
1	Telephone exchange keyboard apparatus, J. J.	.00 = .0	
. 1	O'Connell		
1 3	Telephone system, I. Kitsee	4.30.960	ľ
ĭ	Telephone system, I. Kitsee Temperature regulator, electric, L. F. Easton,	430,643	ľ
9	Tenoning machine, C. Seymour	430,788	ľ
ı	Thill coupling, Merrell & Rippey	430.782	ı
5	Tie. See Bale tie, Railway tie. Tile, building, W. H. Pride	420 010	ı
1	Tire shrinker, C. M. Moss		ŀ
0	Tire truing machine, P. Gendron		١
2	Tires, making, P. Gendron		ı
6	Tobacco moistener, P. Hamm		
1	Tongs, pipe, M. Cooper		
5	Toy for forming soap bubbles, C. Latschar		
	Trace support, H. F. Leibsie		
1	Traction engine. J. E. Clark		ľ
В	Tray, exhibition, IL K. Dyer	130,842	ı
7	Trimmer. See Wick trimmer.		ı
5	Trolley carrier, Nelson & Easton		ı
,	Truss, F. Cluskey Truss, W. & W. H. Payne		١
	Tube cleaning device, F. Brady		ı
8	Tuyere, F. G. Nordmann		١
6	Twist drills, manufacture of, J. C. Taft	430,792	١
	Type setting machines, feed appliance for, Clay &		١
2	Marchant.	430,624	l
1	Typewriting machine, E. M. Hamilton, 450,771 to 430,773, 430,775 to	430 777	
	Typewriting machine key, E. M. Hamilton		١
3	Vehicle seat back, W. A. Nason		l
6	Vehicle spring, E. Neff	430,745	l
3	Vehicle wheel, H. A. Reinhold	430,687	l
0	Ventilating apparatus for kitchen or other apart- ments, Z. M. Moe	430 687	١
4	Vise for bolt cutting machines, laterally adjust-	200,001	١
3	able, A. L. Bretland	430.825	l
5	Vulcanized plastic compound, W. Kiel	4 3 0 ,9 5 8	l
8	Vulcanized plastic compounds, manufacturing,	420.050	l
.;	W. Kiel		l
3	Waron spring buffer, A. G. Fischer		l
	Wall coverings, coloring or decorating paper for,	•	l
	T. Strahan		١
	Washer making machine, S. J. Shimer		ı
7	Watch case spring, T. K. Benton		l
0	Watch, repeating, C. Ruhnke		I
9	Water closet, G. B. Howell	430,885	l
	Water closet cistern, H. A. Egan		l
5 9	Water closet overflow, W. S. Mayo	430,966	l
4	Water tube boiler, W. S. Black	2 30,914	l
9	Starkenberg	430,790	l
	Welding and upsetting machine, Toulouse &		I
0	Delorieux		١
0	Welding or metal working, electric, M. W. Dewey Wheel. See Barrow wheel. Car wheel. Cog		Ì
9			١
5	wheel. Fith wheel. Gear wheel. Vehicle		1
1	Whiffletree hooks, spring catch for, J. M. White		1
)1	Whistle steam, Quinlan & Knebel	431,007	1
30	Wick trimmer, A. Reichmann	431,008	
7	Window casing and frame francof E E D	430,832	
0	Window casing and frame, fireproof, E. E. D. Kern	431.025	1
23	Window jack, G. H. Reed		1
	Wire stretcher, Case & Killian	430,621	
14	misment out like misment like and lat		1
j3	wrench.		1

DESIGNS

DESIGNS.	
Altar or shrine, household, F. P. McGovern	19,92
Button, J. Pettibone	19,92
Cane or umbrella handle, H. O. Schmidt19,941 to	19,94
Cane or umbrella handle, H. A. Weihman19.949,	19,95
Carriage body, W. P. Fest	19,95
Engine bed, steam, R. H. Mather	19,92
Glass, ornamentation of, W. L. Pilkington	19,93
Oil cloth, C, T. & V. E. Meyer19,930 to	19.9:
Quilting fabric, C. Schultz	
Rug, R. J. Grubb	19,92
Rug, A. Petzold	19,94
Rug, A. Weiss	19.32
Spoon, mustache, G. W. Thompson	19,52
Stamp box, postage, A. Thommen	19.92
Stove, heating, W. J. Keep	19,92
Stove, heating, Keep & Wipfler	19,92
-	

TRADE MARKS.

IRADE MARKS.	
Axes, Kelly Ax Manufacturing Company	18.084
Cigars, A. Caffray	18,060
Cigars, C. Schendel & Co	18,088
Collars and cuffs, Celluloid Novelty Company	18,076
Cotton goods, D. Benlisa	18,07.5
Fire crackers, E. S. Hunt & Son	
Games, parlor, Halma Company	18.089
Ginghams, J. Farnum & Co	18.078
Hair tonics, J. Grossman	
Hats and caps, C.F. Beatty	18,070
Knives, forks, spoons, and other solid and plated	
ware, M. W. Galt, Bro. & Co	
Oil, harness, W. B. Davis	
Pails, wood pulp, New York Wood Fiber Company	
Pills, J. Fitzgerald	18,079
Remedy for diseases of the brain, nerves, and	
muscles, Peruvian Medicine Co	18,087
Remedy for diseases of the nervous and sexual	
system, C. S. Hardy	
Salt, Nash, Whiton & Co	
Sheetings, J. H. Walker & Co	
Shirt waists, A. H. Brinkmann	18.067
Shirts, waists, underwear, and furnishings, Haw-	10 000
ley, Folsom & Ronimus	
Soap, Lautz Bros. & Co	
Soap, bar, C. E. Marsh & Co.	
Sodawater, J. L. Billau	
Stoves, oil and gas. Blue Flame Manufacturing	10,000
Company	18 069
Tar and its chemical products, Kunheim & Co	
Toy torpedoes, C. Nelson	
Trousers and overalls, I. Lesem & Co	
A Datas d ann of the manufaction and de-	
A Printed copy of the specification and draw	

any patent in the foregoing list will be furnished from his office for 25 cents. In ordering please state the and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian Patents may now be obtained by the nventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of \$40 each. If complicated, the cost will be alittle more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained,

Movertisements.

Inside Page, each insertion - - - 75 cents a line. Back Page, each insertion - - - \$1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

USE ADAMANT WALL PLASTER



It is Hard, Denne, and Adhesive. Does not check or crack.
It is impervious to wind, water,
and disease germs. It dries in a
few hours. It can be applied in
lany kind of weather. It is in genleral use. Licenses granted for the

Address ADAMANT MFG. CO. 309 E. Genesee St., Syrncuse, N. Y.

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLIEMENT, 59. Frice 90 cents. To be had at this office and of all newsdealers.





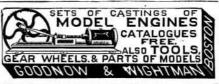
ROCK DRILLS AIR COMPRESSORS

MINING AND QUARRYING MACHINERY, Ingersoll - Sergeant Rock Drill Co.
No. 10 PARK PLACE, NEW YORK.
Send for Complete Priced Catalogue.



S3 PRINTING PRESS.

Do all your own printing. Save money. Catalogue for two stamps. Kelsey & Co., Meriden, Conn.

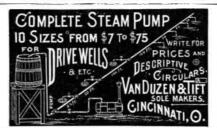


PHE PENNA. DIAMOND DRILL & MFG. CO. BIRDSHORO, 1'A., Builders of High Class Steam Engines. Diamond Drilling and General Machinery. Flour Mill Rolls Groundand Grooved.

NEW CATALOGUE

Contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent free of charge to any address.

MUNN & CO., 361 Brondway, New York.



SAFE BOILERS FOR AMATEUR WORK
By G. D. Hiscox.—Description of several types of safe
steam generators for the use of amateurs—the pipe coil
boiler, the pipe boiler, pipe sectional boiler. With 3
illustrations. Contained in SCIENTIFIC AMERICAN SUPMARKET No. 744: Parion of leasts. To be had early PILEMIENT, No. 702. Price 10 cents. To be had at this office and from all newsdealers.







Boston, Mass

POP SAFETY VALVE WATER RELIEF VALVE IMPROVED STEAM GAGE STEAM ENGINE INDIDATOR

STEAM ENGINE INDICATOR
Single Rell ('hime Whintle, and all instruments
used in connection with Steam, Air and Water.
Sole Agents for Clark's Linen Fue Hoss. CROSBY STEAM GAGE & VALVE CO. 100 No. 100 No.

BRASS SCREWS NUTS AND FITTINGS FOR ELECTRICAL PURPOSES IN STOCK. SPECIAL WORK TO ORDER. T.F.WELCH&Co. BOSTON MASS

WORKING MODELS and Experimenta Inventions developed. Accurate & intricate work a specialty. N. ERLANDSEN, 107 Rivington St., N. Y.

HOME-MADE INCUBATOR. - PRACTIcal directions for the manufacture of an effective incubator that has been carefully tested and found to perform all that may be reasonably expected; with directions for operating with 4 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. NO. 630. 'Frice 10 cents. To be had at this office and from all newsdealers.



THE

Scientific American

ESTABLISHED 1846.

The Most Popular Scientific Paper in the World.

Only \$3.00 a Year, including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is pub isled weekly. Every number contains six-teen 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, Te egraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete List of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC A "ERICAN will be sent for one year—52 numbers—postage prepaid, to any subscriber in the United States, Canads or Mexico, on receipt of three dollars by the publishers; six months, \$1.50; three months, \$1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars. The safest way to remit is by Postal Order, Draft, or Express Money Order. 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.,

361 Broadway, New York.

THE

Scientific American Supplement.

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers, and accompanied with translated descriptions. The Scientific American Supplement is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geclogy, Mineralogy, Natural History, Geography, Archwology, Astronomy, Chemistry, Electricity, Light. Heat, Mechanical Engi-Chemistry, Electricity, Light. Heat, Mechanical Engineering. Steam and Ruilway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economics Photography, Medicine Agree Agreements of Sank my. Biography. Medicine, etc. A vast amount of fresh and valuable information obtainable in no other pub-

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the Supplement.

Price for the SUPPLEMENT for the United States and Canada, \$5.00 a year, or one copy of the Scientific Am-ERICAN'and one copy of the SUPPLEMENT, both mailed for one year for \$1.00. Single copies 10 cents. Address and remit by postal order, express money order, or check,

MUNN & Co., 361 Broadway, N. Y., Publishers SCIENTIFIC AMERICAN.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. \$2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming a large and splendid Magazine of Architecture, richly adorned with elegant plates in colors, and with other tine engravings: illustrating the most interesting examples of modern Architectural Construction and

A special feature is the presentation in each number of a variety of the latest and best plans for private resi-dences, city and country, including those of very mod-erate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Spec fications, Sheets of Details, Estimates, etc.

The elegance and cheapness of this magnificent work have won for it the Largest Circulation of any Architectural publication in the world. Sold by all newsdealers. \$2.50 a year. Remit to

MUNN & CO., Publishers, 361 Broadway, New York.

