He also says that the Nicholson pavement, contrary to many statements, stood the test remarkably well.

"In some places the upper part was charred off, especially where it was new; but the curbstones were in some places actually destroyed, while the Nicholson pavement remained intact. I would suggest as to whether the presence of tar in the wood was not similar in its effects to the presence of the oil in the stone. We may possibly discover a valuable property in tar or oil, from this experience."

Iron structures and parts of structures were badly injured, with the exception of corrugated iron floors supporting concrete arches of masonry, the iron being simply a basis for the masonry.

Vaults built in the tower form, from the cellar up, proved the most efficacious; heavy brick vaults built upon floors are severely deprecated.

The importance of fireproof shutters is earnestly dwelt upon. Mr. Wight says:

"No matter how they are made, so long as they are strong enough; make them double or treble or quadruple, with air spaces between, but by all means keep out the fire from neighboring buildings, even if you have nothing in your own house to burn. Every fireproof building should have fireproof shutters on every window, whether on the front or on the rear. It is the habit with us to put them on the rear, and very often to leave them off the front. We say "Our building is fireproof; there is nothing in it to burn." But there is something in it to burn, and the very books, papers, furniture and carpets used have proved—as in some of these buildings in Chicago—sufficient to soften an iron beam, and destroy the best constructed floors."

Great emphasis is also laid upon the proper construction of roofs. They should "be made the best part of the building." In a great fire fanned by a hurricane, the current of heated air comes directly down on the tops of the buildings, instead of the fire communicating from house to house. This fact is shown by numerous examples, adduced by the speaker, which we have not space to reproduce, having already exceeded our prescribed limits.

We have seldom read a more instructive discussion, and if Mr. Wight fulfils his intention of writing an elaborate paper upon the subject, he will confer a great benefit upon the public.

POWER PRODUCED BY STEAM, UNDER DIFFERENT TEMPERATURES AND PRESSURES.

At the present stage of our knowledge in regard to the conversion of heat into motion, the steam engine stands foremost as the least expensive and most convenient apparatus to accomplish this transformation. Being founded on the increase in volume of water, when changed by heat into steam, it is easy to calculate the amount of heat required to produce a given power, for the reasons that the amount of the increase in volume of water when becoming steam, and the amount of heat required to accomplish this, are both well known.

To simplify our calculation, let us suppose that we have a long vertical tube 6 inches in diameter, or of 27 square inches, or $\frac{1}{5}$ of a square foot, sectional area. The whole length we suppose to be 144 feet; then the whole contents of the tube would be $\frac{1}{5} \times 144$, or 27 cubic feet. Suppose now we have, at the bottom of this tube, water one inch high; then we shall have 27 cubic inches, or one pound of water. Let us finally assume that we give this water heat enough to convert it all into steam. Then, as it expands 1,700 times, it will just fill the tube, which is 144 feet, or 1,728 inches long. The heat required to change one pound of water into steam is 965 units, and the power produced we may easily estimate by considering that the steam will possess one atmosphere's pressure and be just able to remove the atmosphere from the tube, as this has a pressure of 15 pounds per square inch, or $15 \times 27 = 405$ lb. for the whole sectional surface of the tube, in which a piston might separate the steam from the air. This piston will, by the expansion of the steam, be moved through a distance of 144 feet, and, being subject to the atmospheric pressure of 405 pounds, the force produced by the evaporation of one pound of water will be $144 \times 405 = 58{,}320$ foot pounds.

If this result is accomplished in one minute, we shall have one and two thirds horse power, as 33,000 foot pounds per minute has been adopted for the amount of one horse power. We see, therefore, that the evaporation of one pound of water per minute, or 60 pounds per hour, gives us one and two thirds horse power, and this agrees tolerably well with experience, which has taught that the evaporation of one cubic foot—that is, 63 pounds of water per hour—is amply sufficient for one and a half horse power. As we have seen (p. 184) that one pound of coal is able to evaporate 13 lbs. of water, the evaporation of $5 \times 13 = 65$ lbs. water requires 5 lbs. of coal (producing one and two thirds horse power), or three pounds of coal per hour for one horse power. And this is indeed the ordinary estimate for economical engines with Cornish boilers; locomotives consume double that amount, and even more.

The question now arises: Is it not more economical to raise the temperature of the water higher than only 212°, which only obtains one atmosphere's pressure? Is it not more advantageous to work with a pressure of several atmospheres?

The answer to these questions is affirmative; but it must be remembered that the rule, usually given, that water expands 1,700 times so that one cubic inch of water makes one cubic foot of steam, is only applicable to steam of 212°; at higher temperatures there is a lesser bulk of steam. At 250° Fah. we have increased every inch of water only to 900 inches of steam and a pressure of 30 lb.; at 293°, the volume is 475 inches and the pressure, 60 lb.; at 340°, the volume is 250 inches, and the pressure, 120 lb.

In regard to the heat required: Steam of 212° consumes 965 units of latent heat; steam of 250°, or 38° more, does not require 38 more units, but only 11, as the specific heat of this denser steam is less. At 293°, or 43° more heat than the latter and 4 atmospheres' pressure, we require only an addition of 12½ units of heat; at 340°, or 47° more heat and 8 atmospheres' pressure, we require only an addition of 14 units of heat.

It is thus seen that every additional atmosphere's pressure requires the addition of a lesser amount of heat, while the capacity for heat or specific heat of the steam decreases by an increase of the heat and pressure. Therefore, the same addition of heat has more effect, when applied after a high temperature and pressure have already been obtained, than at a lower temperature and pressure. The figures here given have been obtained, by Régnault, by the most careful methods of research.

If we apply the same reasoning as before to our tube, with steam of 250° Fah. and two atmospheres' pressure we find that the piston is lifted, by a force of $2 \times 27 \times 15$ lbs., or 810 lbs., through a space of 900 inches, or 75 feet, producing 810×75, or 46,170 foot pounds, for $965 + 38 = 1{,}003$ units of heat. When heating the water to 293°, we have 4 atmospheres' pressure, and thus $4 \times 27 \times 15 = 1{,}620$ lbs.; and as the water expands only 475 times, it will raise the steam of this pressure to the hight of 475 inches, or nearly 40 feet, and will lift the 1,620 lb. that distance, which is equivalent to 64,800 foot pounds, for $965 + 81 = 1{,}046$ units of heat. Finally, for 340°, the steam expands 250 times, fills the tube to the hight of 250 inches, or nearly 21 feet, at a pressure of 8 atmospheres, or $8 \times 15 \times 27 = 3{,}240$ lbs.; this, lifted 21 feet, gives 68,040 foot pounds, for $965 + 128 = 1{,}093$ units of heat employed.

It is seen that there is an advantage gained, but it is not as great as supposed by many. The pressure of one atmosphere gives 58 foot pounds per unit of heat; 2 atmospheres, 60 foot pounds; 4 atmospheres, 63·5; and a steam engine of 8 atmospheres, 65·5 foot pounds for every unit of heat consumed. But if we take into consideration that, at high temperatures, there is more loss of heat by waste of fuel, radiation, etc., it is evident that the advantages gained may be overbalanced by disadvantages.

In practice, it is customary not to consider the first atmosphere, or 15 lb. pressure, but to call steam of 250° Fah. and two atmospheres, or 30 lb. pressure, one atmosphere, considering only the 15 lb. above the ordinary atmospheric pressure; one atmosphere has, therefore, to be subtracted from our theoretical figures, in order to make them agree with the customary terms used in practice.

A LONG FELT WANT.

There has been a long felt want for a transparent material, which could take the place of glass for many purposes, without the fragility of the latter substance. The substance which comes nearest to these requirements is mica, but in many respects this fails to meet the want. It would seem that the present resources of chemistry might be adequate to furnish to the world such a material as we have named. So far as we are aware, but little experiment has been made toward the attainment of less brittleness in glass. The ancient process of annealing is still solely relied upon; with how much success, let the myriads of broken lamp chimneys globes and mirrors testify.

It would not be necessary, to render a non-brittle transparent and easily molded material valuable, that it should be insoluble in water, but it would be very desirable that it should withstand the effects of considerable heat. Gelatin, of which beautifully transparent plates can be made, is not only soluble but is decomposed by high temperatures. Are the two properties of transparency and brittleness in solids inseparable? We have no general reason, except the fact that most transparent materials are brittle, to justify such a belief.

Chemistry may yet render glass as little liable to breakage as hard rubber. Could this be done without change in its other characteristics, the utility of glass for general purposes would be increased a thousand fold. The man who can do this cheaply would supply a process of incalculable value.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Facts for the Ladies.—Dr. A. K. Gardner, of New York, says there is not the slightest foundation for the vague and interested statements that the light Wheeler & Wilson Lock-Stitch Sewing Machine is injurious to feminine health. We speak advisedly when we deny most positively that any form of disease is traceable to its proper use by any woman in health. For twenty years we have carefully watched the progress of the Sewing Machine, visited the large factories where it is used by the hundred, questioned the makers, the foremen in the workshops, the girls daily working them, and never yet have been able to trace a single disease as having originated from the use of this domestic implement. See the new Improvements and Woods' Lock-Stitch Ripper.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—COATING CAST IRON WITH COPPER.—I wish to know of a good process for coppering cast iron by dipping.—F. M.

2.—SIGNAL LIGHT.—What composition is used for the white (Bengal) Indian light?—H. M. L.

3.—INDIAN INK STAINS.—Will some reader inform me how to entirely obliterate Indian ink marks from the skin?—H. W. B.

4.—WATER TELEGRAPH.—How can I construct a water telegraph such as is used in most mountainous districts? Any information will be highly appreciated.—W. M. R.

5.—PAINTING INSIDE OF WATER TANK.—Please inform me what kind of paint I should use for the inside of a wrought iron water tank? The water is to be used for domestic purposes.—P. R.

6.—KEEPING IRON CONTINUOUSLY MELTED.—Will some of your correspondents inform me if there is any way of running a cupola continuously, day and night, so that one or two tuns of iron could be drawn from it per hour, and if so, how?—B. A.

7.—KEY WAYS AND KEYS.—Will some of your many machinist readers please inform me the correct taper of keys, for connecting rods for engines, also the average taper of key seats of pulleys, etc. ?—A. P.

8.—LINING CAST IRON VESSELS.—I have a number of cast iron porcelain lined soda water fountains, with part of the porcelain broken off, exposing the iron. Is there any cement or other preparation, which I could apply, that would be durable and not color the soda water or make it taste?—C.

9.—PRESERVING TELEGRAPH POLES.—Will some of your readers inform me the best way to preserve butt ends of chestnut telegraph poles, that they may be made to last as long as their tops? Will gas tar or charing the ends help to preserve them?—H. R. R.

10.—GROVE'S BATTERY.—I am constructing a Grove's battery, and I understand that the amalgamated plate is a mixture of zinc and mercury. Am I right, and will some one give me the right proportions of the two metals? What proportion should the surface of the amalgam have to that of the platina? What should be the dimensions of the porous cup? My zinc cylinder is open at one end; it is a quarter of an inch thick, and eight inches high by four inches internal diameter. How should the amalgam be prepared?—J. C. G.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal.

ALL reference to back numbers must be by volume and page.

PAINT FOR IRON.—In reply to enquiry No. 6, April 27th, about paint for iron, etc., we have received letters from various makers, stating that their article is the best, and asking us to publish an account of their goods. We would suggest to these manufacturers that they insert short advertisements of their goods in the column of "Business and Personal," and in this way they will be able to place the merits of the r articles before all our readers.

C. B., of N. C.—The specimen you send is pulverized quartz containing a little iron.

LEAKY BOAT.—A. B.. of Pa, should caulk his boat with oakum and pitch.

NEST OF BOILERS.—T. E. W., of Md., is referred to pages 356, 388, 394 of Vol. XXV. of the SCIENTIFIC AMERICAN for a full discussion of the question he proposes.

B. F. B., of R. I.—An advertisemei t in our "Business and Personal" columns will doubtless obtain you the information required.

B. C., of Ohio.—Artificial stone is either run into molds while in a fluid state, or is, while plastic, pounded into the molds by an in strument similar to that used by iron molders.

J. S., of Col. Ter.—We shall be glad to hear from you as proposed.

A. H. A., of Mich.—Upon examination of the description and drawings sent, we do not find anything to account for the anomalous working of the boilers described. An examination on the spot by an expert might perhaps lead to the discovery of the cause.

L. P. L.—We do not think you incur danger from the use of a galvanized iron chain in your pump.

J. W. C.—We do not know of a reliable meter for measuring the flow of steam through pipes. Measuring the water supplied to the boiler is a good way of determining the quantity of steam used in a given time. Or you may condense the steam, and by ascertaining the weight of the condensed water, determine it in that way.

F. J. L., of Ohio.—There is no solvent of scale in boilers that can be universally used with good results. We have published much upon this subject; consult back numbers. Also see recent editorial for answers to queries about asbestos packing.

C. A. B., of Ohio.—Glass could, we think, be easily molded as you require. Consult some manufacturer.

J. R. W., of N. Y.—The salts used in England for street watering are the chlorides of calcium and sodium. Chloralum has also been used, it is said, with good results.

A. W. C., of Iowa.—The specimen of rock which you send is a limestone, with disseminated particles of iron pyrites or "fool's gold."

A. V. P., of Mich.—The specimen you send appears to consist mainly of alumina and some alkali, either lime or potash. An analysis will be needed to determine exactly, which will cost $10.

CEMENT FOR RUBBER BOOTS.—P. H. W. can find the required information on page 155, current volume SCIENTIFIC AMERICAN.

DEPOSIT IN LOCOMOTIVE CYLINDERS.—The enclosed is a sample of a substance which gets into some of the cylinders of locomotives. It accumulates so as to fill up the clearance space in a short time. We are all using the same tallow, yet some engines of the same class do not form it, although all use about the same quantity of tallow. What is your opinion of it, and what is the stuff composed of? When first taken out it is like soft pitch. Some of the engineers blame the stacks; these are nearly all self cleaners. All the engines burn wood.—J. R. M. Answer: It is the result of the distillation of some hydrocarbon, probably derived from the tallow. The engineer should be able to tell why it gets into some cylinders and not into others.

SEPARATION OF MERCURY IN THERMOMETER TUBE.—To F. D. H., query 1, page 281.—Heating the thermometer bulb until the mercury fills the whole length of the tube will unite the separated parts of the column. The separating of mercury in a barometer tube is caused by air entering; it is rather difficult to remedy. You had better take it to a maker of those instruments and get him to refill the tube.—L. T. Y., of Pa.

MERCURIAL COLUMN.—Query 11, page 217.—The chamber containing the mercury should be of sufficient size to hold more mercury than the column, so that water from the pump will not get into the latter. The pipe leading to the column should be let into the bottom of the chamber. The pipe from the pump should be let into the top of the same. One atmosphere, or 14·71 pounds pressure per square inch, equals a column of mercury 29·22 inches in hight, nearly two inches mercury for every pound pressure per square inch. This is near enough for all practical purposes; therefore a column, to indicate 60 pounds per square inch, should be 120 inches in hight from the zero or starting point to the last mark. The columns in different cities ought to agree if they are spaced off with equal care, and the board upon which the spaces are marked does not shrink or expand.—F. J., of N. J.

TEMPERING SPRINGS.—Query 26, page 169.—Harden the spring in linseed oil, then heat it gradually over the fire until it becomes hot enough to burn a small shaving, scraped off, on the sharp edges of the spring, from a piece of hickory wood. At first the shaving will lie on the spring a few moments before it will burn, but as the spring becomes hotter, the shavings will burn as soon as they are scraped from the wood. At a point between these two extremes, I have been able to give a spring temper to different qualities of steel.—L. V. B., of N. C.

TINNING CAST IRON.—On page 212, current volume, Mr. Charles Thompson gives a method to tin cast iron. It will not do at all. I have tried the same thing before. If he ever had occasion to tin cast iron, he certainly could not have done it by the method he describes. I use muriatic acid with zinc dissolved and diluted with water, and a small quantity of sal ammoniac; but it is not what is wanted. There must be some other preparation which is better.—W. S. M.

TIMBER FOR WATER PIPES.—Query No. 8, page 249.—Spring water can be conveyed in pipes, during one generation, made as follows: Take "tamrack," or, as it is called in Massachusetts, "hackmatack" logs, with the bark on or off, from six to eight inches diameter and ten feet long. Bore these, beginning at the small end with a gimlet pointed pod bit. Get three quarter inch band iron, and make some hoops thus: Bend a piece to make a circle say of four inches diameter, then bend back each end making a semicircle or a little more; then, with a hammer, drive this into the end of the log around the hole edgewise. This will secure the log from splitting when the thimble is driven in to connect the logs. Dip the iron thimbles in boiling tar. The holes, o course, must be reamed to fit the slant of the thimbles.—R. S. B., of Mass.

ADHESION OF RUBBER BELTS.—Query 2, page 233.—Use castor oil; it will keep the gum soft and prevent its becoming glossy.—J. H.

ADHESION OF RUBBER BELTS TO PULLEYS.—Query 2, April 6.—Linseed oil will prevent rubber belts from slipping, and will make them last longer.—J. H. G., of Tenn.

FIREPROOF WOOD.—H. S., query 9, February 24, should immerse his wood in nitric acid. The surface of the wood corroded by the acid is incombustible.—G. H., of Mo.

PRESERVING BIRD SKINS.—To W. J. L., query 15, April 20.—The cheapest and most successful process is to rub the skins with equal parts of alum and arsenic.—H. W. U., of Wis.

DRIVING ELEVATOR.—To C. W. W., query 9, page 333.—You can drive your elevator from the lower pulley with fair success, yet I would much prefer driving from the upper pulley. I am using one, elevating all kinds of grain and mill feed, driving from the bottom, with 13 inch belt, 12 inch buckets (12 inches apart), 75 feet high. The lower pulley is 2 feet and the upper 3 feet in diameter. The larger the lower pulley the better it will work.—R. G. S., of Ill.

FINISHING FURNITURE.—Query 6, page 265.—The cheapest and quickest way to finish cheap furniture is, for black walnut color, to use asphaltum varnish for a stain; when dry, rub smooth with curled hair, then coat it with shellac and alcohol varnish; rub that with fine cane shavings, and lastly use furniture varnish. Other colors may be obtained by using a combination of cheap colors mixed with japan and spirits of turpentine.—A. B.

PRESERVING BIRD SKINS.—Query 15, page 265.—I have used powdered white arsenic for four years with good success. It keeps out moth, and cures the skins perfectly. It is applied dry. I have also used an arsenical soap for heavy skins and large birds. It is made of the following ingredients: Arsenious acid, 2 pounds; carbonate of potassa, 12 ounces; camphor, 5 ounces; white soap, 2 pounds; powdered lime, 8 ounces; reduce each to powder and mix.—A., of N. Y.

TEMPERING SPRINGS.—To W. R. H.—Tempering is only one, and that the last, condition essential to a good spring. The first is good material, and this should be the best refined cast steel. The next is that the material must be carefully and properly worked into the proper shape and proportions throughout; lastly, heat the spring evenly to a bright blood color, cool or chill it in melted lard or lard oil, free from salt, acids, or other chemicals (home made lard is the sure thing), hold it over the fire, blowing a little heat slowly and evenly, till the lard begins to blaze; then hold it away from the fire till it is entirely blazed off, and lay it down to cool. If appearance is an object, now carefully polish your spring and it will improve in elasticity. A strict compliance with all the above conditions will make good springs for all purposes, for traps set under water not excepted. A spring trap set under water is the greatest test that I know of. Many good springs will stand severe frost that water will break in fifteen minutes.—S. P., of Mo.

GATE FOR GANG SAWS.—Mr. J. V. Walter states, in his comments on E. F. J.'s communication about gang saws, etc., in your issue of March 2d, "that a less number of pounds of cast iron makes a better and stiffer gate than wrought iron." We build wrought gates very light, some as light as 600 pounds, to carry 32 four and a half feet saws; and 750 pounds is plenty heavy enough for a gate to carry 40 saws. Now if Mr. Walter will inform us how to make a lighter gate of cast iron (or any other metal no more expensive) which will bear the strain and labor required of a gang, he will do not only us but the milling public a great favor. I heartily concur with him in regard to the source of trouble with E. F. J.'s gate. I think that 5,500 pounds is too heavy a load to be jerked about at the speed a gang should run.—P. H. W.

PIN POINTS IN STEEL.—To H. M. H.—When the forging is done, heat the article to a dark blood color, just such as can be distinctly seen in a dark place; then cool it in soft water. The exact degree of heat can be ascertained by experimenting; a little too hot or a little too cold will harden it. It must be heated evenly throughout.—S. P., of Mo.

TO COLOR CASTOR OIL.—Take two ounces of annatto and form it into a paste with a little water; add half a pint of alcohol, shake occasionally for a day or two, and filter. To one quart of castor oil, add the above tincture until the desired color is obtained.—H. W. B., of N. J.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

BOILER EXPLOSIONS.—B. C T.—J. B.
COTTON WOOD TREE.—H. G. M.
ELECTRICAL MACHINE.—J. C. W.
RAPID TRANSIT FOR NEW YORK.—A. M. W
STEAM PROPULSION ON CANALS.—C. B.
NOTES AND QUERIES.—F. X. F.—W. C.—T. C.—H. W. B.—J. L. R.—J. T. C.—N. F. O.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

HARNESS SADDLE.—Samuel E. Tompkins, of Sing Sing, N. Y.—This invention relates to improvements in the coach pads particularly intended for double harness, and which have heretofore been, for cheapness, made with a metal top plate and leather under pad, and finished on the end with a metal extension of the top plate instead of a leather pad, inclosing a metal stiffening plate, as in the better class. The invention consists of separate and attachable metal or leather extensions, either of which may be used at will, as preferred; and it also consists of a construction of the top plate by which it is adapted for said extensions, whereby greater beauty of design and finish are combined with a form of top plate that can be cast cheaper, and that insures more perfect and uniform castings than can be had with the top plates as at present arranged. In the better class of harness the top plate is inclosed between the leather, and the bindings are formed on the cushion, which is the most desirable way, except for the cost. The object of this invention is to approximate the advantages of the method named and yet economize considerably in the cost. The top plate is made with ends in separate pieces, to be attached as heretofore described, so that either leather or metal ends may be used, as desirable. Another advantage in the use of the attachable iron end is that the cushion part is fitted to the plate, and the space between it and said plate for the side strap is preserved much easier than in the old way, in which it is necessary to insert leather pieces temporarily, over which the leather cushion is fitted, and then the pieces are withdrawn and the side straps put in, which requires experienced workmen; whereas in this case, the metal extension being put on, it remains and becomes the form or part to which the cushion is fashioned.

STAND FOR TESTING FIRE ARMS.—Julius Lehnert, of Louisville, Ky.—This invention provides convenient and reliable means for holding firearms, such as rifles, pistols, etc., to be loaded and fired without danger of displacement, in order to ascertain the accuracy of the bore and adjust the sights. The invention consists in the use of a table, provided with a hinged leaf to which a clasp for holding the arm is applied. When the leaf is in a vertical position it holds the arm convenient for loading, while when horizontal the same is in a position for firing. The arm to be tested can be conveniently loaded in the vertical position, and fired as often as necessary in the horizontal position, and will, as long as the table is not shifted, remain in the position for firing, thus giving good opportunity for accurate tests. The leaf is locked in the horizontal position by pins or catches, applied to or through its front part.

METALLIC TELEGRAPH POLES.—Francis Boyd, of Newburgh, N. Y.—This improvement in metallic telegraph poles consists in constructing such a pole with collars for supporting horizontal arms which carry the insulators, in the means of connecting it with the base piece, and in the arrangement of a lightning rod or conductor. The cast metal tube has a suitable step, with arms for bedding in the earth to support the pole. Braces extend from the extremities of the arms to ears cast on the pole, the braces being fitted through them, with screen nuts above for straining them to adjust the pole to a vertical position. A collar or ring is cast on the pole for holding the lowermost insulator arms; and shoulders for the other arms are formed by successive reductions of the size of the pole. The arms may be made of metal bars, with a large hole at the center to fit on the pole snugly above the shoulders, each arm having its hole corresponding in size to that of the pole above the particular shoulder whereon it is to rest, said arm either being made in one piece and put on over the top of the pole, or it may be divided in two parts, longitudinally and vertically, and bolted together. The lightning rod passes down through an insulating tube, and projects above the top of the pole, being insulated by an india rubber cap fitted watertight on the top of the pole, the hole through which the rod passes being packed tightly to prevent the water leaking out. The insulated arms have holes for holding wood pins or india rubber insulators which may screw into the arms or be attached in any other suitable manner. The arms are galvanized; the parts below ground are coated with coal tar and the parts of the pole above ground are scaled and primed with red lead.

BOOT STRAP MACHINES.—Aaron F. Stowe, of Worcester, Mass.—This invention has for its object to furnish an improved machine for cutting the draw straps for boot legs, which shall be so constructed as to adjust itself to the varying thickness of the doubled leather, and which will feed the leather steadily to the knives, so that the straps may be cut straight. It consists in a combination of a grooved or channeled feed roller, with circular knives, a knife roller, and top roller of the machine. If desired, part of the knives may be placed at a distance apart different from the others, so that straps of different widths may be cut by the same machine and at the same time. This construction is particularly advantageous in shops where different sizes of boots are made, as, for instance, men's, youths' and boys'.

WAGON WRENCH.—Roland J. North, assignor to himself and B. B. North, of Cornwall, Conn.—This invention furnishes an improved wrench for removing the axle nuts of wagons and other vehicles, so constructed that, when applied to the nut, the nut will be screwed from or upon the axle by simply revolving the wheel. The body of the wrench is made with two arms which are curved, so that the body may enter the hub band and receive the nut. The arms are made of such a length that they may extend along the sides of the hub and pass between the spokes, so that the wheel, when revolved, will carry the wrench with it, and thus screw the nut off or on, according to the direction in which the wheel is revolved. The wrench has a square hole sufficiently large to receive any axle nut, which may be made to fit smaller nuts by a bushing or block having a hole of the proper form and size to fit the desired nut. Coiled springs, the ends of which are attached to the outer parts of the arms, and the other ends of which have hooks formed upon them to hook upon the spokes of the wheel, hold the wrench securely in place while allowing the nut to move out or in as it is screwed off or on the axle. If desired, the wrench may be secured in place by screws, wedges, or other suitable and convenient devices.

COMBINED PROPELLER AND FIRE EXTINGUISHER.—Allen Turner, of Bronson, Mich.—In this invention a screw works in a cylinder closed at the forward end, but having a pipe descending through which air passes into the cylinder and is forced out against the water to propel the boat. The reversing of the screw draws in water and forces it out of the pipe for the extinguishing of a fire should it occur upon the vessel carrying the device. Two or three screws are employed, one on each side of the rudder.

BRIDLE.—Martin A. Penn, Sumter, S. C.—The invention consists in making the headstall of a bridle of metallic plates which can be made more cheaply and more durable than leather; in the mode of adjusting the blinds by means of a projecting and adjustable spring to which they are each attached; in holding the side plates at any adjustment by means of a catch and sliding sleeve; and in attaching the headstall and reins to bit by hooks.