Nature of Electricity.

Prof. Thompson has shown how a series of floating magnet poles of like name, repelling one another, tend to produce equal distribution of the poles. Prof. Thompson, arguing from the second law of electrostatics (inverse squares), sought to explain the first law in a rational manner, on the hypothesis of self-repelling molecules, which tend to uniform distribution. When there is a surplus in one part and a deficit in another, the molecules are urged toward each other, *i. e.*, attract. This was shown by putting a surplus of floating magnets at one part of the basin. By the movements of these magnets, when confined in barriers and with surplus and deficit purposely made, the author imitated the effects of a Leyden jar, induction, a battery current, etc., the motions and arrangement of the poles illustrating the hypothetical behavior of electricity. The author was led by the hypothesis to infer that either the ether is electricity, or that the ether is electrified, and the former seemed the simpler conclusion.

GRINDING MILLS.

High grinding, low grinding, and gradual reduction, or a system which will more or less completely embody the elements of any two systems, have engaged the attention of millers to a remarkable degree for some years past. With the efforts made for the advancement of this industry there have come remarkable improvements in all kinds of grinding mills. The dressing of burr millstones and the attention given to their running have also directed inventors to the making of improved forms of other grinding mills, where various designs of grinding and cutting disks of metal have been introduced for a greater variety of work, and for its performance in a much better way than was formerly possible.

We herewith illustrate some points of mills now being made, which are guaranteed to do a wide variety of work—to be fully equal to any pair of French burr millstones or any roller mill for the reduction of wheat to flour, either for the first breaks or regrinding the middlings and bran, also for fine corn to table meal, or corn and cobs to feed meal, as well as drugs, spices, and calcined bones to powder.

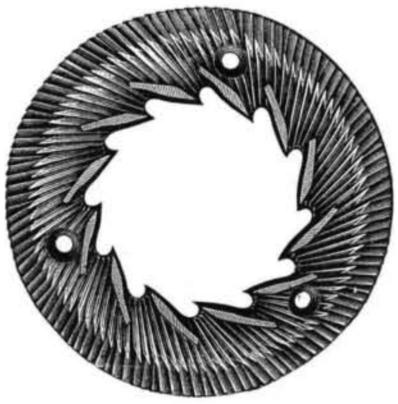


Fig. 1.

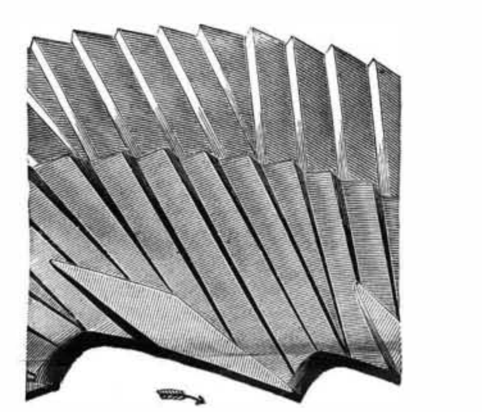
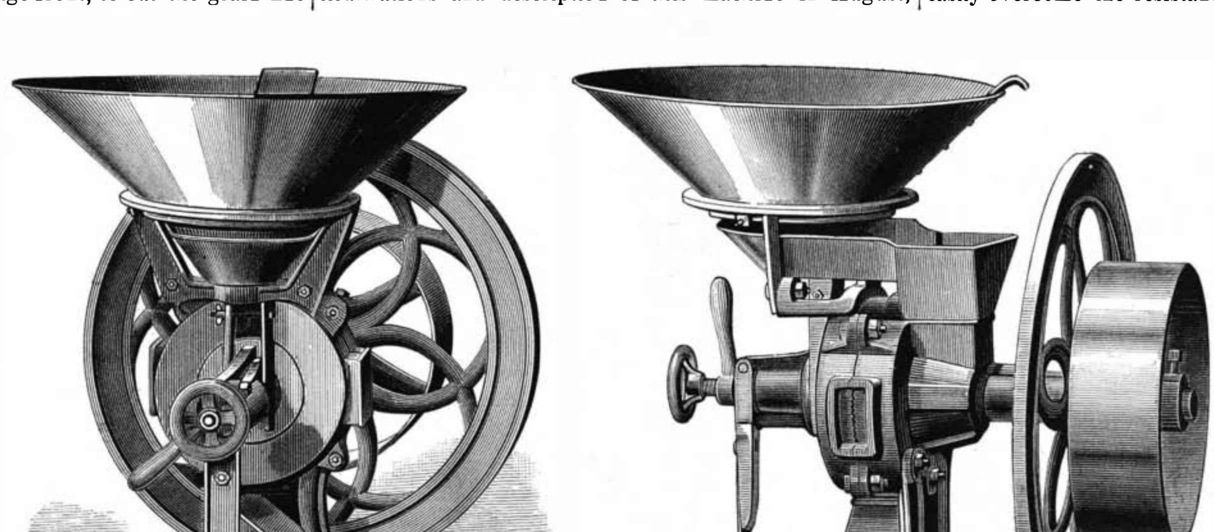


Fig. 2.

Fig. 1 represents the front side of the grinding disk, and Fig. 2 is an enlarged view of the same. The first reduction is produced in the bosomed part of the disk, where the furrows run sharp cutting edge front, to cut the grain fine with the least power possible. The second reduction is upon the flat outer circle of furrows running their inclined sides front, to mash and mellow the meal already cut fine. The saw toothed inner edge of the disks forms a natural crusher, to reduce pieces sheared from the cob, so they will pass through the mill by the aid of the conveyer flights arranged around the eye of the disks. These conveyer flights are arranged to act like a fan to draw cool air and grain into the mill at a low speed. The grain, first cut fine, is then rolled, mashed, and mellowed so perfectly that it enlarges in bulk. The grinding disks are cheaply renewed and easily interchangeable. A spring extending from the bridge tree down to the base gives sufficient elasticity to allow of nails and spikes passing through the mill without injury, while not crowding during the grinding.

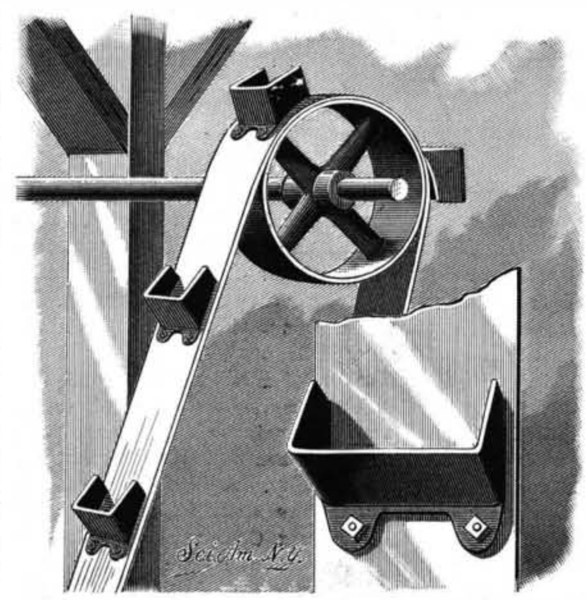
These mills are made in several varieties, adapted for either animal power or steam or water power, the "Scientific grain mill" and "Quaker City grinding mill" especially having acquired an enviable degree of popularity. Their special construction is covered by several patents, and the makers, Messrs. A. W. Straub & Co., of 2,227 to 2,231 Wood Street, Philadelphia, endeavor to make them the best mills in the market.



STRAUB & CO.'S GRINDING MILL.

ELEVATOR BUCKET.

The buckets shown in the accompanying engraving may be constructed of either wrought, malleable, or cast iron, or other suitable material. Each bucket is made with a back and sides but without any bottom, the belt on the outside of which the bucket is arranged serving that purpose. The outer edges of the sides are so shaped as to conform, or nearly so, to the circular travel of the belt around the drums.



HOLMES' ELEVATOR BUCKET.

The buckets are secured to the exterior of the belt by short bolts passing through flanges on the back, whereby they may be readily attached to or removed from the belt. By making them without an attached bottom and arranging them on the outside of the belt they will readily and quickly empty themselves as they pass over the upper drum of the belt, as the flexing of the belt will work the contents away from the open bottoms of the buckets, relieving the mass within and giving it a quick and free discharge. The construction effectually prevents the clogging or sticking of the mass to the interior. As the buckets have but three sides, the belt answering for the fourth, they can be more easily made than those having four sides. The elevator can also be arranged vertically or nearly so, and its buckets will empty freely, thus saving a large amount of space in mills having several stories. This form of bucket is cheap, simple, and durable.

This invention has been patented by Mr. Joseph A. Holmes, of Greenland, N. H.

Demagnetizing of Watches.

One of our contemporaries, in noticing the "queer freaks of watches" from having become magnetized by being brought too near dynamos or swift running belts, is led to refer to the Maxim machine for demagnetizing them as one whose "mechanism is a secret." Readers of the Scientific American will doubtless remember that we gave illustrations and description of this machine in August, 1881. The theory on which it works is that the different parts of the watch—the plates, arbors, mainspring, balance wheel, etc., all being magnetized, though with different degrees of strength, are brought within the influence of a powerful magnet, and then rapidly rotated, so that the watch is subjected to rapid reversals of polarity, while at the same time it is being steadily withdrawn from the field of influence of the magnet. The opposite poles, of course, destroy the magnetism of each other, and the recharging of each separate piece in the watch is prevented, or rather is successively weakened by the gradual withdrawal under the compound motion the machine gives the watch. An interesting paper explaining early experiments in this line, with full illustrations, will be found in Supplement Nos. 206 and 207. It was written by Prof. Alfred M. Mayer, of the Stevens Technological Institute.

Another Possible Cause of Boiler Explosions.

M. Vignes, in the *Journal la France*, draws attention to experiments made as long ago as 1846, by Professor Donny, of Ghent, and intended to show the influence which air exercises on the boiling point of water and on the character of its ebullition. In this experiment, ordinary water is placed in a clean glass tube, open at one end, and boiled long enough to drive away not only the air above the surface of the water, but all the air dissolved in the water. Then when the upper part of the tube is full of pure steam, the mouth is hermetically sealed and the tube is left to cool. When cool, it is about half full of water, above which is vapor of water at a very low pressure. The tube being thus prepared, its lower end is plunged into a bath of glycerine or oil, which is gradually heated. No ebullition is visible in the tube when the temperature reaches 234 degrees Fah. At 240 degrees Fah., however, the column of water bursts, as it were, in two, with a sudden explosion, and part of it is flung against the sealed end with such force as often to break it open. Now in industrial works, it often happens that a boiler, having been filled with water, works for three or four hours without receiving a further supply. It may then be cooled down, and the next time it is wanted it may very probably be fired up again without starting the feed pump, the water level being judged sufficiently high; but the water in such a boiler will be in the same condition as that in the test tube; that is, it will be deprived of all air, and consist of water below and vapor above, the latter, however, being probably at a much higher pressure than that of the water in the tube. This water has no free surfaces in its interior due to the presence of bubbles of air, from which evaporation can take place. Consequently, as in the test tube, there will be delay in vaporizing—at least, until the expansion becomes great enough to overcome the pressure of the superincumbent vapor, and a sudden flashing into steam, which will be of the nature of an explosion, and may easily overcome the resistance of the boiler. The pressure thus attained may be very great. In the test tube, the pressure of the temperature of explosion—240 degrees Fah.—will be eighty-six times what may be taken as the pressure of the superincumbent vapor in the boiler, as already observed. That pressure will probably be much higher, and the pressure of the explosion will probably be much higher also. To avoid this source of danger, it will be sufficient, as M. Vignes points out, to make it a rule always to feed a boiler when it is fired up after standing. This will have the double effect of lowering the pressure and of facilitating evaporation, by distributing the mass of water in the boiler, and charging it to some extent with bubbles of air. Meanwhile, the facts he has adduced are certainly sufficient to warrant a belief that we have here a key to many cases of boiler explosions which have hitherto been wrapped in mystery, and it seems very desirable that careful and precise experiments should be undertaken to prove or disprove the production, on a large scale, of the phenomena thus shown to exist in laboratory experiments.

The Knibbs Valve Patent Suits.

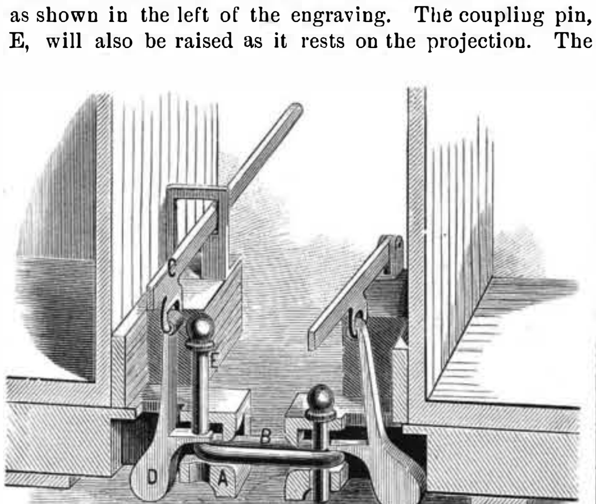
It is expected that the old Philadelphia, the first steam fire engine, which was recently taken to Boston as evidence in an important patent suit against that city, will be returned to its owners, the Insurance Patrol, to-day or to-morrow. The suit was by Marcus P. Norton and others, assignees of James Knibbs, of Troy, N. Y., who claimed to hold the original patent for a relief valve which was extensively used upon its steam fire engines by the city of Boston and elsewhere throughout the country. In the former city alone the royalties claimed by the plaintiffs amounted to $450,000. The part taken in the case by the old engine Philadelphia was interesting. It seems from the statement of those who accompanied her to Boston that she was wanted to prove that the valve for which the complainants claimed the patent right had been used on her two or more years before the patent was issued. During the trial the court and jury adjourned to the Boston Common to witness a practical comparison of the working of the valve of the old engine with that of one of the latest construction. The result, it is said, was amazing, as the old engine, which many feared could not stand the strain, threw a larger stream with two pieces of hose than the other did with one. The valves, it was stated, were shown to be the same, to the satisfaction of the jury, and a verdict for the city of Boston was rendered on Saturday last. Among those who testified with reference to the valve of the Philadelphia was Jacob Neaffie, builder of the engine and member of the firm of Neaffie and Levy; Joseph L. Parry, the designer; Richard Warren, an engineer of the present Fire Department; and George Kurtz, the original engineer of the Philadelphia, who conducted the practical test at the trial, and who managed the engine over 20 years ago, when her usefulness was exhibited in the city of Boston, near the same spot, and a prize of $600 won.—*Phil. Ledger.*

Plate Glass Insurance.

A plate glass insurance company having to pay 1,456 losses in eight months to September, report 343 breakages from stone throwing, etc.; imperfect glazing caused 144; 86 door plates were broken by wind and 59 by wind and hail; burglars, 76; malicious persons, 43; runaway horses, 24; persons falling on sidewalk, 39; window cleaners, 103; moving shutters, 54; with other breakages from 59 down to 1, the last caused by a flying owl.

CAR COUPLING.

The drawhead, A, which is of the usual form, is provided with a longitudinal slot in the bottom, in front of which are the usual pin holes. Two blocks project from the end of the car, and on one of them a standard is secured to which a lever, C, is pivoted, which passes through a slot in a standard on the other block. An offset or shoulder is formed in one edge of this slot on which the free end of the lever can be rested when it is to be held in a raised position. The lever extends nearly, or quite, to the side of the car, and if desired can be connected with a rod extending to the top of the car. To the middle of the lever is pivoted a pendulous ocking bar provided at its lower end with an inwardly and downwardly inclined weighted lug, D, and with a prong projecting toward the outer end of the draw head. The top of the draw head has an aperture through which the pendulous bar passes. When a car is uncoupled, the free end of its lever is raised and held in this position on the shoulder as shown in the left of the engraving. The coupling pin, E, will also be raised as it rests on the projection. The



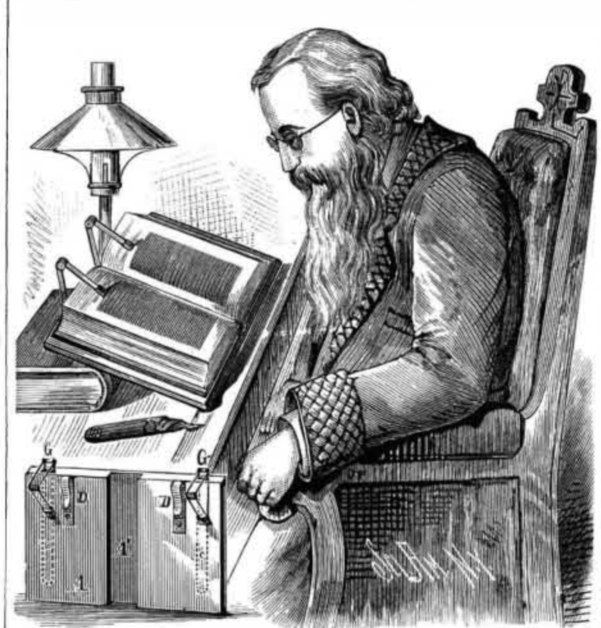
DOUGHERTY'S CAR COUPLING.

weighted lug tends to swing the bar toward the end of the draw head, thus keeping the projection in place. As the link enters it strikes the lug below the projection and swings the bar inward, thereby moving the projection from under the pin, which drops through the link, coupling the two cars together. When the free end of a link held in one draw head is to be raised so that it can pass into the opposite draw head, the weighted end of the pendulum bar is permitted to act by its own weight on the end of the link, as indicated in the right of the engraving.

This invention has been recently patented by Mr. M. J. Dougherty, whose address is Box 136, Carbondale, Pa.

BOOK HOLDER.

The board upon which the book is to rest is provided with a wide central transverse groove, A', for receiving the back of the book. The covers of the book rest on the raised parts of the board at each side of the groove, and are held in place by spring tongues, shown at D, secured to the upper surface of the raised portions. Parallel with and a short distance from each end is a recess formed in each raised part of the board, and which are open at the upper edge of the board. In the recesses are held sliding frames, which are bent upward at their outer ends, forming spring arms inclined toward the upper surface of the board and having pads on their free ends. The pads are pressed on the leaves of the book, holding them down. A pintle passing through each slot and slide prevents the slides from being



WOOD'S BOOK HOLDER.

entirely withdrawn. When a leaf is to be turned the spring arms are raised and the slides drawn from the recesses, so that the arms will be entirely out of the way of the leaves. The slides are held in this position by the friction caused by the pressure of the spring against the sides of the recess. The device can be placed on vessels, desks, music racks, etc.

This invention has been patented by Mr. Elbridge J. Wood, of Palmer, Mass.

Manufacture of Tin Plate.

Stoll, of Stuttgart, delivered a lecture on this important industry, one of the few not known here, of which Dingler's *Polytechnic Journal* publishes the following interesting abstract:

Tin plate can be classified, according to the iron used, as follows: Charcoal plate, puddled iron, coke plate, and steel plate. In a few works sheet iron is still made of iron refined with charcoal. Of course an excellent quality of pig iron must be used to make puddled iron of good and best quality. Steel plate is made of very tough steel made by different processes. The so-called charcoal tin is made by refining pig iron and scrap with charcoal, and is very dense and strong. For this reason tin plate made from it is rather harder to work, but will stand longer and is better than that made from softer iron. Only puddled iron is generally used for coke plate, since a better quality is rarely required for such tin.

The iron used in making tin plate is prepared as follows: The blooms, weighing from forty to fifty hundredweight as they come from the puddling or refining furnaces, are first placed under steam hammers, then rolled into thin bars, which are cut up and tied in bundles. These bundles are strongly heated in the reheating furnace, thoroughly wrought, heated again, rolled into bars in calibrated rolls, then cut in lengths corresponding to the different sizes of plate, and called platins or plate iron. These bars are then rolled out with hard rollers into sheets, which are trimmed with huge scissors to the exact sizes met with in commerce. The sheets must be pickled to remove the coating of oxide (rust), either hydrochloric or sulphuric acid being used according to circumstances.

The material is rendered so hard and brittle by this treatment that it has to be annealed before proceeding to the next step, namely, smoothing and polishing it. This is accomplished by heating it in tightly closed boxes or muffles, the plates being packed tightly together. These muffles are placed on wagons and run in a warming furnace, where they are left ten or fifteen hours. The polishing is performed by drawing the sheets of iron, after they have been pickled and tempered, between polished rolls of hard cast steel heavily weighted.

To get a clean metallic surface, such as is requisite to receive the tin, the iron must be dipped repeatedly into quite dilute sulphuric or hydrochloric acid, then polished and scoured, each one separately, with sharp sand over the entire surface. It is now ready to receive the tin, and passes to the tinning room.

In this room there are five kettles, all of the same height, placed in a row and heated with fires beneath them. They are called the grease kettle, the tinning kettle, the brush kettle, the fine tin or roller kettle, and the grease kettle. The different operations performed in these kettles take place in this order: The pickled and scoured plates are put in the first kettle and thoroughly coated with grease; usually pure tallow, but sometimes palm oil is used. Then it goes to the tin kettle, in which it is moved about until evenly tinned all over. From this it goes to the third kettle, also containing tin. Here each individual plate is taken out and brushed with an oakum brush or pad of hemp to remove the coarser particles. It is next put in the fine tin (*passirkessel*), then in the last kettle, that also contains hot grease, on a grating, or moved up and down in it by rollers. When the plates come from this kettle they are placed on racks to cool. The tinning is now completed, but they do not look very nice, owing to the adherent grease. To remove this they are drawn through three or four large boxes filled with slaked lime, sawdust, bran, or flour; flour is the best of all, for it cleans them better, and after it gets saturated with grease the flour can be used for cattle feed.

After the tin plates leave these boxes they go to the polishing bench to remove the dust. This bench consists of a table covered with woolen cloth, or a sheep pelt, and the sheets are rubbed singly with a rubber made of wool or sheepskin, which brings out the pure, fine luster of the tin.

The tin is next assorted by a careful inspection of both sides, and classified as first, second, or third quality. Sheets that are imperfectly tinned are sent back to the tinning room, while the rest are packed in wooden boxes and the brand burned on.

Attempts have been made to replace the fat with chloride of tin, but tin plate made in this way was found to be inferior to that made by the old process, because it is far more prone to rust. At present scarcely any tin plate is made with chloride of tin, but some manufacturers use this process for tinning cooking utensils.

Another improvement consists in passing the tin, as it comes dripping from the last bath of melted tin, between rollers that squeeze off the excess of tin and leave a uniform coating of any desired thickness according as they are set close or far apart.

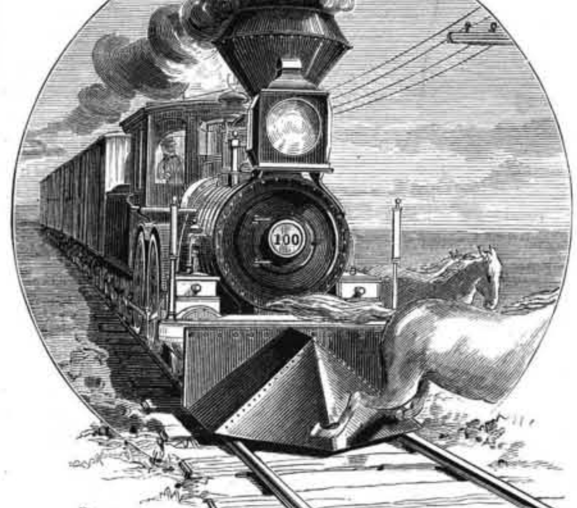
Elm is the wood generally used for boxing tin.

Errors in Maps of New York State.

The survey of the State of New York, according to the official report of the Commissioners, bears out the conclusion that French's map of 1860 is the best map of the State in use, although it is found that the boundaries of counties in central New York are misplaced from one to two miles. The city of Owego is there placed a mile further west than it really is, and the western boundary of Tompkins County is two miles too far west. The boundaries as marked on the grounds are correct, and the State Survey maps, when completed, will represent the boundaries as they actually exist.

LOCOMOTIVE COW CATCHER.

The accompanying illustration represents a device for removing or throwing from the track animals or heavy obstructions, such as rocks, without danger of derailing the engine. The cow catcher is made of plates of boiler iron firmly connected to form a Λ-shaped box, open at the under side and inclined to a point at its forward end. At the bottom is a frame of bars, serving to strengthen the plates. The catcher is bolted firmly to the bumper of the



PHILLIPS' LOCOMOTIVE COW CATCHER.

engine, and is made wide enough to cover the rails. On the lower edge of each side is connected a strong spring plate, having its end extending backward and downward so as to terminate just above the rail. The cow catcher is made strong enough to lift an animal so as to throw it back upon the rear part, from which it will roll off. The springs are strong enough to resist heavy pressure, and will remove small objects not removed by the catcher, and, in case the rails should be sprung, will act to force them down so that the wheels can pass safely over.

This invention has been patented by Mr. William Phillips, of Marshfield, Oregon.