MACHINE FOR TRIMMING PAPER ON FOUR SIDES.

This new machine, manufactured by Messrs. Lhermite Bros., of Paris, is designed for shaping registers, copy-books, letter paper, etc., and, in general, all articles of paper that are trimmed in large quantities to a given size. Such sizes being rarely square, and nearly always rectangular, and, moreover, the blade having always to remain invariably in the same place, the problem to be solved was the finding of a combination that should permit each side of the rectangle to come alternately in contact with the blade throughout its whole length, and that, too, accurately and automatically. The following description will show by what means the manufacturers have succeeded in finding a satisfactory solution.

The cast iron frame of this machine supports, at its rear, a trimming apparatus, which consists of a cutter-head that moves between two checks affixed to the frame. This cutter-head, which is guided by two rollers and by slanting slides, is connected with a lever which oscillates upon a fixed point, and which is coupled with a connecting rod that is actuated either by hand or power, through the intermedium of a train of gear wheels.

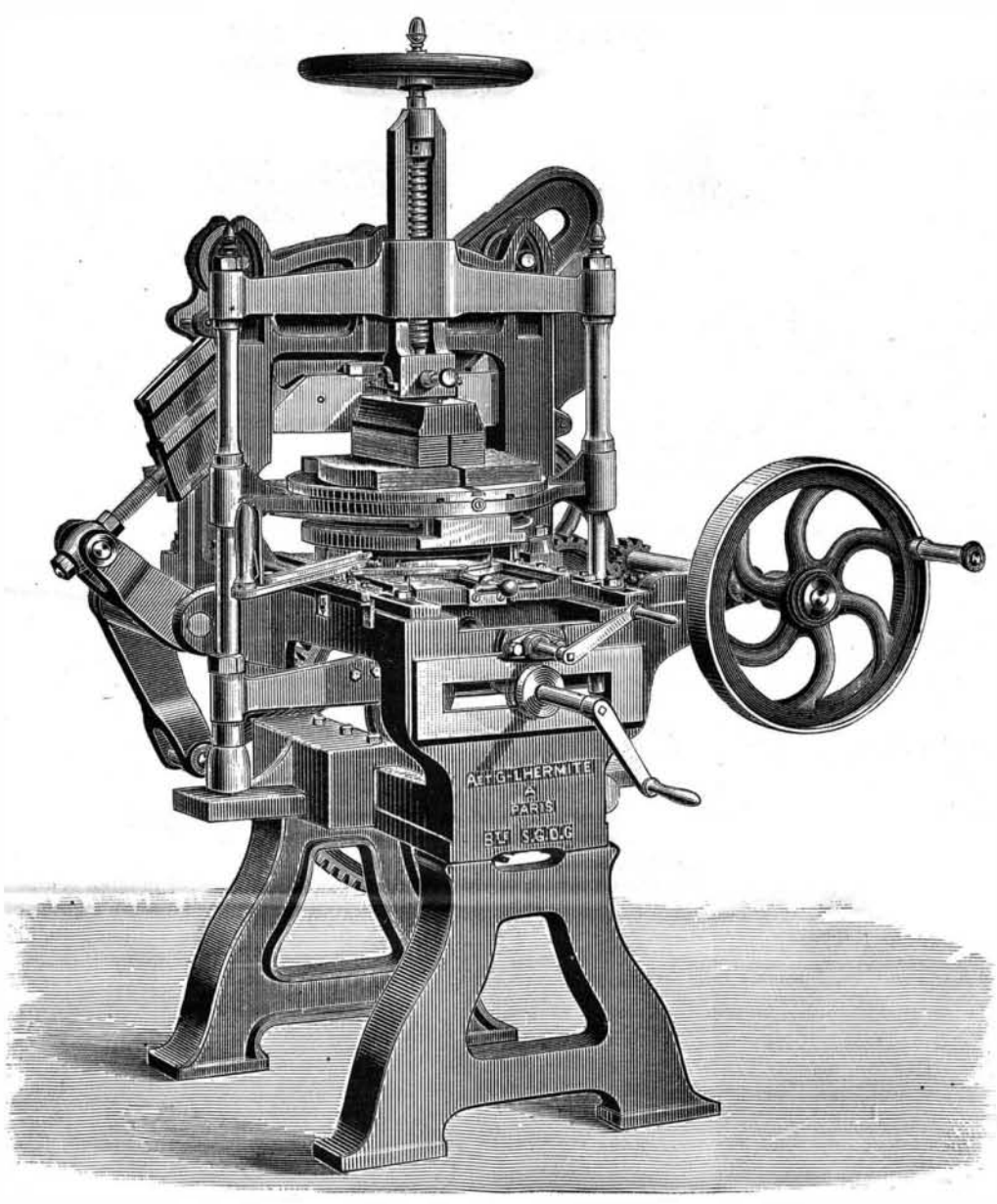
The movable part of the machine consists of two iron uprights, whose lower portion forms a cup and contains a ball that rolls over a support bolted to the frame. These two uprights are connected at their upper part by a cross brace, and at the middle by an annular plate, in whose center is a pivoting disk that is designed to receive the paper. The upper cross piece forms a nut, and carries at its center a screw provided with a hand wheel. The gauge, which is fixed to the lower extremity of the screw, is capable of being given a rotary motion independent of that of the latter, and is held by a bolt that indicates at the moment the paper is pressed whether the gauge block is exactly parallel with the blade.

The lower cross piece carries a collar that is designed to receive the extremity of the rod of the pivoting disk. Around this latter, and beneath the annular plate, there is an iron circle which is made eccentric with respect to the latter by an amount equal to half the difference between the two sides of the gauge block.

For shifting the paper after each cut, a horizontal lever is used which is quite similar to the reversing bar of a locomotive, and which causes the pivoting disk to revolve. In order that the latter shall not make more than a quarter revolution, a click drops into a notch at the precise moment that it should stop. This click is lifted by the lever itself when the latter is pulled back in order to make another quarter revolution. From this arrangement it will be seen that, aside from a rotary motion, the disk that carries the paper, and consequently the entire affair formed of the cross pieces and uprights, has a shifting motion, which is communicated thereto by the lever and eccentric circle.

In front of the machine there are two winches, one of which serves, through the intermedium of beveled gear wheels, to rotate the disk *in situ*, while the other is designed to permit of the approach or recession of the carriage that carries the entire movable part, so as to put one of the faces of the gauge (the eccentricity of the circle having been regulated with regard to the size to be obtained) in contact with the blade. The carriage is afterward fixed to the frame with screws, so as to secure an invariable position for it.

The machine, after it has been regulated, is operated as follows: Two packages of paper are taken and placed back to back (as shown in the figure), and squared up by means of a guide arranged for the purpose. The gauge employed being double the size of one of the packages, it follows that, in *four* cuts, *two* completely trimmed packages are obtained. Moreover, as the disk that carries the paper is so arranged that it can be rendered movable perpendicularly to the blade, and independently of the other motions, it therefore becomes possible, by operating with a gauge quadruple the size that is to be obtained, to cut in two what has been obtained by the first operation, and thus form *four* packages with *five* cuts only. The machine may, when necessary, be employed as an ordinary trimmer, and trim piles of paper as much as one-tenth of a meter in thickness.—*Annales Industrielles.*

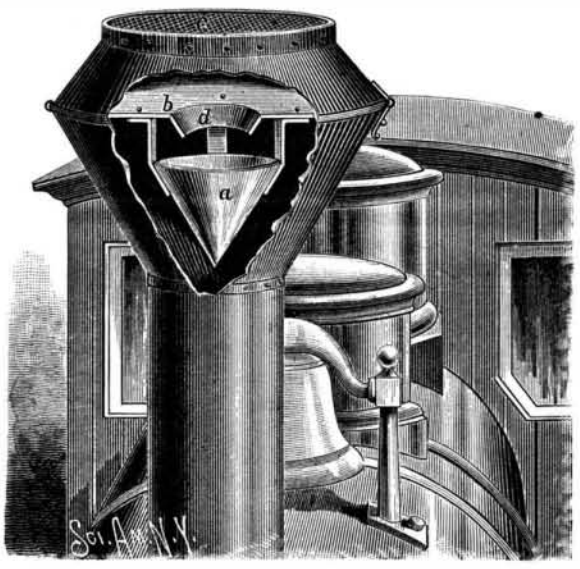


LHERMITE'S MACHINE FOR TRIMMING PAPER.

ABOUT a hundred thousand Canadians are engaged in the lumber business. The total product of lumber in Canada in 1881 was $38,541,752.

SPARK ARRESTER.

An invention recently patented by Mr. John C. Printup, of Rome, Ga., is to prevent sparks from escaping from smoke stacks of locomotives and other engines. The smoke stack has a flaring head, to which is hinged a tapering top secured by a spring catch. To the upper edge is fastened a wire gauze, *c*. A circular sheet iron plate, *b*, having a central circular aperture, is riveted to the upper edge of the head of the smoke stack. An inverted sheet iron cone, *a*,



PRINTUP'S SPARK ARRESTER.

is suspended at a little distance below the plate by brackets. The base of the cone is larger than the aperture, and the cone is of such size that the area of the annular space surrounding it is at least equal to the area of the cylindrical part of the stack, so that the draught will not be obstructed. The sparks that pass up the stack strike against the convex surface of the cone, *a*, are deflected against the outer part of the plate, *b*, and shell of the stack, and fall back to the lower part of the stack, from where they can easily be removed.

New Use for Electricity.

The endless diversity of uses to which electricity may be put received another illustration recently at the Court Opera at Vienna, where, by the simple expedient of suspending tiny incandescent lamps by fine swinging wires, the effect was produced of swarms of fireflies flitting about a tropical forest. By switches the current is turned off and on, and the effect, as the artificial fireflies flash and dance in midair, is said to have been electrical in other than a literal sense.

The Arlberg Tunnel.

The piercing of the mountain was successfully completed, as far as the advanced heading is concerned, on Tuesday, the 13th of November, 1883. The tunnel proved to be three meters shorter than had been calculated, and thus the meeting took place a day sooner than was intended. The *Engineer* says a similar miscalculation in the St. Gothard Tunnel was attributed to the attraction of the mountain. Another great Alpine highway is preliminarily opened up, just two years after the first experimental trip conveyed about sixty passengers—contractors, engineers, and their friends—through the tunnel of the St. Gothard. The new tunnel is 10,270 meters in length, while the Mount Cenis Tunnel is 12,323, and the St. Gothard 14,900 meters. The first took fourteen years and a half, and the second about eight to bore; the Arlberg Tunnel will have taken, when vaulted and ready to receive the first locomotive, about four years. Dynamite has been largely used, and the Brandt revolving rock drill has been employed, as well as the Ferroux percussion drill. For these drills several streams from the heights of the snow-covered Arlberg were gathered on the eastern side into reservoirs, from which turbines which compressed the air to five atmospheres, for the Ferroux borers, were worked; while on the western side pumped water was passed through pipes to the pressure of over a hundred atmospheres, to work the Brandt revolving borer, which cuts cylindrical blocks of rock from the mountain.

The gallery has been driven on a level with the bottom of the future tunnel, and not on the Belgian system, as was formerly done, on a level with the top. Large money premiums were granted for completing the work before the stipulated time—in which premiums the contractors allowed their workmen to share. The two halves of the work were allotted on December 21, 1880, to two contractors—Ceconi for the eastern part, and the Brothers Lapp for the western side; but the piercing of the galleries, effected in the beginning by ordinary tools, as the nature of the stone did not allow the employment of boring machines, had already begun in June, 1880. On November 13 and November 17 respectively, the percussion and the rotating borers began their work, which advanced on each side at an average of from 5 to 7 meters daily, the greatest effort having been achieved in 1882, when 3,590 meters were bored, while the St. Gothard Tunnel had a maximum of boring in 1878 of only 2,530 meters. The whole cost, including the double tracked railway through the tunnel, will not exceed eighteen million florins, or one and a half million pounds, including the premium to the contractors for early completion; while the cost of the whole railway line from Innsbruck, in the Tyrol, to Bludenz, in the Austrian province of Vorarlberg, passing through the Arlberg Tunnel, will be forty million florins. The third Alpine tunnel connects parts of the same country, and not foreign countries, as in the case of its forerunners.

How to Glaze Photographs.

BY E. WIDEMAN.—Take virgin wax, 8 grammes, and of ordinary ether, 100 grammes; shake, and allow them to dissolve. Over each plate to be waxed (take care they are perfectly clean) pour a little of this liquid, 8 or 10 drops, and polish with a pad of linen until all traces of the wax have disappeared. Next dissolve about 40 grammes of white gelatine in 400 of ordinary water in a hot water oven, and filter through a cloth or fine sieve into a porcelain dish. Coat the waxed surface of the plate with normal collodion, of 1 gramme gun-cotton to 50 of ether and 50 of alcohol. When just set, immerse in the warm gelatine bath, while the mounted photograph is also soaked until thoroughly impregnated with gelatine.

Raise the plate with the finger to let it drain, and allow the gelatine to form a solid body with the collodion, and apply the picture to the surface without taking out of the bath. Press the card against the glass, beginning at the top, and inclining them as they are being taken out; with the other hand cause the rest to adhere by lightly rubbing the card down with a fine sponge.

Afterward wipe off the excess of gelatine from the back of the card and reverse of the plate; leave it to dry in a warm place, and in about eight or nine hours cut round the edges, and if it is dry it will come apart directly.

A little experience will suffice to obtain very pretty results, free from bubbles; the gelatine may be colored at will with aniline dyes soluble in water.—*La Nature.*

Irrigation Works in Italy.

The irrigation system of Italy is probably the most complete in the world, and still it is constantly being increased; it forms a part of the elaborate system of defense against floods necessitated by the conformation of the Northern Provinces. According to the latest official statistics, the irrigation canals of Piedmont alone give 125,550 gallons per second, distributed over 1,340,000 acres; and those of Lombardy 95,355 gallons per second, distributed over 1,680,400 acres. These great works have not been,comparatively speaking, expensive. The Cavour canal, constructed within the last few years, draws its supply from the rivers Po and Dora Baltea. It gives a flow of 29,200 gallons per second, waters nearly 40,000 acres, and cost 1,600,000*l*., about 32,200*l*. per mile. It was constructed in four years, and measures are now under consideration for increasing its flow by 5,300 gallons per second.

A smaller canal, subsidiary to it, gives 18,540 gallons per second, and cost 24,154*l*. per mile. The largest canals are the Cavour, and its subsidiary canal just mentioned; the Muzza, Agliano, and Naviglio Grande. The smaller of these gives 13,200 gallons per second. Below this point the canals become very numerous, and interspersed all over the country. These canals are not only used for purposes of irrigation, but also to supply motive power, by which again the water is raised to districts lying upon a higher level. On the steep slope of the Dora Baltea, not far from Turin, three canals (the Torea, Agliano, and Rotho) flow parallel to each other, on different levels, while the water is used at the top of the hill, 62 ft. above the highest of them. The arrangement adopted is as follows:

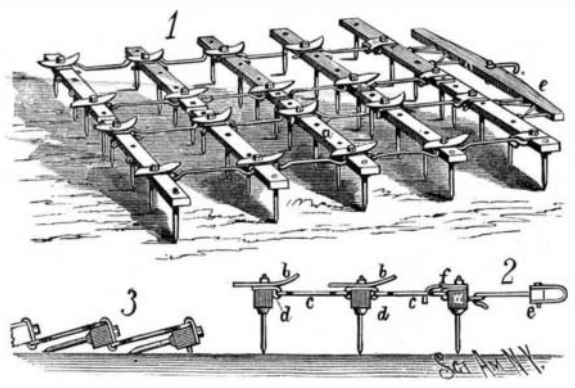
A stream of 15s gallons per second is diverted from the Torea canal, and carried down the hill in a leaden pipe, until it meets the Agliano canal. Here it is pumped up to the summit level by eight pumps, worked by four turbines, driven by a fall of water taken from the Agliano canal, and allowed to flow down into the Rotho. By joining this latter it is used for irrigation, and thus not a drop is wasted. The great principle of Italian engineers is to work on a large scale, thus attaining at the same time efficiency and economy, and avoiding constant alterations and additions; and it is by such means that the extraordinary fertility of Northern Italy is produced and maintained.

A People without Consumption.

A paper was read recently before the Tennessee Medical Society with the title "A People without Consumption, and some Account of their Country." The country in question is the Cumberland plateau. The writer, Dr. Wright, has ~~practiced~~ in the region throughout a generation, and in his assertion of fact touching the entire absence of consumption he is supported by the testimony of about twenty other physicians of standing.—*Medical and Surgical Reporter.*

HARROW.

The harrow represented in the engraving has been recently patented by Mr. William H. Myers, of Oregon, Wisconsin, and is flexible jointed so that it may be adapted for different kinds of work by the different forms in which the teeth may be set. The teeth are held by two series of bars, *a*, placed side by side and arranged transversely to the line of movement, and connected by rods, *c*, that are hinge jointed to the bars by means of plates, *d*, fitted on top of the bars and extending from side to side. The two series of bars are connected by the stretcher sweep, *e*, by means of braced hooks and eyes, which keep them apart, and to which the team is attached. The front bars, to which the sweep is connected, have hook plates, *f*, bolted on top and engaging the rods, *c*, back of the joints to make the joints rigid when the teeth stand upright, as in Figs. 1 and 2, and the other bars have plates, *b*, held by the same bolt that secures the hinge plate. These plates, *b*, are straight to one end and bent upward at the other, and when arranged as in Fig. 1 the teeth will be made to work upright. When the bent end is turned backward the teeth will incline backward, and when turned over so that the bent ends incline downward, the teeth will incline forward and operate like cultivators. With the plates turned lengthwise of the bars and the hook plates, *f*, disconnected, the teeth will lie nearly flat for smoothing and leveling the ground, as shown in Fig. 3. On the rear bars are eye studs, so that when the plates are arranged as in Figs. 1 and 2 the teeth will work upright when drawn as indicated, but will pitch backward if the stretcher be hooked on at the rear end.



MYERS' IMPROVED HARROW.

FIRE ESCAPE.

The accompanying engraving clearly represents the operation and construction of a fire escape in which the explosive force of gunpowder is used to elevate the ladder from the ground to the roof or windows of a building. A small cannon or mortar fires a suitable projectile, to which one end of an iron chain ladder is attached, to any desired point of the burning building. The projectile is made heavy and is fired with sufficient force to crush through the roof, wall, or floor of a building and thus hold the ladder against the

WATTS' FIRE ESCAPE.

weight of at least six persons. As an additional means of holding the ladder, there is a chain connecting the projectile with the ladder and with a suitable grapnel or anchor, not shown in the engraving, which will always catch upon the roof or window casing. The mortar may be placed upon a wagon, as indicated in the engraving, or swiveled upon a cross piece on a fireman's hose truck. At its side is placed the chain ladder, which is to be elevated by the ball. The ball is attached to the ladder by a short chain, having a swivel formed in it so that any revolution during the flight will not be communicated to the ladder; and attached to the chain near the ball may be the grapnel. In a box placed upon the truck is carried the powder. After the ball has found a firm lodgment in the building, the foot of the ladder is drawn away from the wall and secured in that position by iron rods driven into the ground, as shown in the right of the illustration. As no combustible material enters into the construction of the ladder, flames will have no effect upon it. With this device a ladder may be quickly raised to any part of a building, the inmates of which would thereby be provided with a means of escape.

This invention has been patented by Mr. Geo. W. Watts, of 433 Court Street, Brooklyn, N. Y.

Trials of Pumping Engines.

On September 26, Mr. M. Curry, the borough engineer of Dover, made an official trial of a pumping engine erected upon the Corporation Water Works, by Messrs. Simpson & Co., of Grosvenor Road, London. The engine was designed to pump 75,000 gallons of water per hour 150 ft. high, excluding friction, and was guaranteed to consume not more than 2·6 lb. of coal per actual or pump horse power per hour, the actual delivery of the pump being taken and nothing allowed for friction in the main. Nixon's navigation Welsh coal was used, and the results obtained during a trial of 11 hours 45 minutes were 6 per cent in excess of the guarantee. The average indicated horse power, was 78·2, and the coal consumption per horse power, 1·92 lb.; the pump horse power was 61, that is, 78 per cent of the indicated horse power under the unfavorable condition of no allowance being made for the friction in the rising main. The coal consumption per actual horse power measured from the water lifted without allowance for friction in mains, was 2,461 lb.

Messrs. Simpson & Co. are most enterprising in carrying out tests of engine performance, and equally liberal in giving to the profession the results of their experiments, as was evidenced by the capital paper on the subject, presented by Mr. J. G. Mair, one of the partners of the firm, to the Institution of Civil Engineers the year before last. One of the engines supplied by Messrs. Simpson & Co. to the West Middlesex Water Works gave, in a trial during this year, a consumption of 1·53 lb. and 1·821 lb. of coal per indicated and actual horse power respectively, and others at Chelsea, Berlin, Essen, and Lambeth have approached, although they have not quite attained, these figures, while one of their mill engines, supplied to Messrs. Gibbs & Co., of Victoria Docks, more than ten years ago, was found on a year's running to have used only 2 lb. of coal per horse power per hour. These results, it is to be borne in mind, have been attained when working with steam at low pressures, generally under 50 lb. per square inch, while at Dover the pressure was but 40 lb. It is much to be hoped that before long our water works engineers will follow the example set by the mill owners of the Lancashire and Yorkshire districts, where pressures of 80 lb., 90 lb., and 100 lb. are now common. With such pressures at their disposal we have no doubt that Messrs. Simpson could materially improve even upon the admirable results they have already obtained.—*Engineering.*

Asbestos Enamel.

Powdered asbestos is used by M. Erichsen, of Copenhagen, for making an enamel or coating to be applied to pipes, walls, and so on. The powder is mixed with soluble salts, such as silicate of potash, and mineral or other colors which combine with silicic acid, so as to form a product which resists the action of oxygen, heat, cold, or damp. The coating furnishes a refractory glaze, which protects the material it is applied to, whether wood, gas, or water pipes, and stone or brick buildings. When applied to masonry or wood the surface of these is first washed with soap and water. In preparing the enamel the refuse asbestos only need be employed. It is also proposed to apply the coating to boilers in order to protect the plates against a too intense fire.

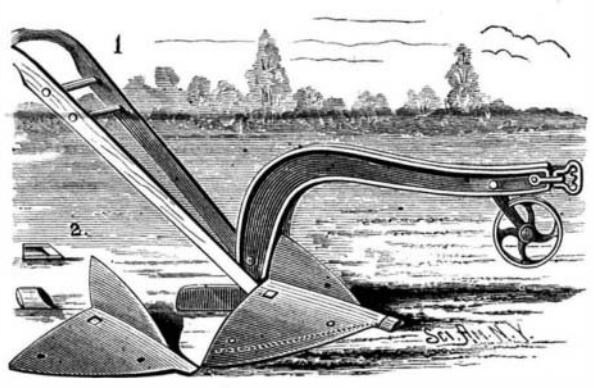
Electric Lighting and Car Propulsion by the Faure Accumulators.

The Paris correspondent of the London *Telegraph* says that when the Continental Hotel there was recently lighted up for the first time under the Faure system, the stored electrical energy was brought to one of the doors of the hotel in a cart. Communication with the candelabra in the largest room of the first floor was established in a few moments, in the presence of some 300 visitors. Many of those present afterward journeyed to the Arc de Triomphe and back in a tram car propelled by electricity supplied in the self-same accumulators, by way of testing the availability of the power thus stored.

PLOW.

The ordinary cast iron plow point of either new or worn out plows is covered with an attachment that can be applied by a blacksmith of ordinary skill, and which increases its strength and durability. This is partly accomplished by a steel covering plate cut and bent to form the share and colter, which may be of any desired shape. This is shown detached in the cut, and in place on the plow. The share is made to project over the right-hand wing of the point in order to give a good, lasting, steel cutting edge, that may be sharpened when needed. The whole may be made from a plate mainly of triangular shape, except the forward end, which lies under the detachable cap point, the left-hand portion of the plate being bent up to form the colter.

The plate thus formed is secured to the plow point by the same bolt that holds the cast point to the plow, the plate having a counter sunk hole for the reception of the bolt head. Having been thus secured, the cap point (Fig. 2) is fitted over the lip end of the plate and forward end of the point. This cap is made of steel plate cut into suitable shape and bent around and welded to form a sheath to the forward end of the point, and having a piece of steel (shown in the section Fig. 2), welded in it at its front end, sufficiently large to permit of the cap being sharpened occasionally. The solid point of the cap is hardened. It is fitted over the plow point by heating it and driving it on.



WEST'S IMPROVED PLOW.

This invention has been patented by Mr. Adam C. West, of Blanchard, Mich., and further information may be obtained from Mr. Charles V. West, of same place.