THE EMPLOYMENT OF DYNAMITE IN LAND CLEARING.

A number of important and interesting experiments with this object were recently performed in the fields and woods of the Calder estate of Sir W. Stirling Maxwell, near the Forth and Clyde Canal. The operator, Mr. Donnie, after explaining the *modus operandi* of the powerful explodent he was about to use, turned his attention to the root stumps of a number of trees that had recently been cut down. By means of an auger, a hole about one and a quarter inches diameter was bored vertically to a depth of twelve or fifteen inches in one of the stumps, and when it was found to be quite through the wood of the stump, it was continued by means of a pinch to a depth of fully two feet. Two or three cartridges were put into the bore-hole and firmly driven home by means of a wooden rammer. Then a small cartridge, called a "primer," prepared with a cap-tipped fuse, was dropped in and rammed home and the hole was stamped or stemmed by filling it to the top with water, care having in this case been taken to put a luting of clay round the junction of the cap with the fuse. The latter was fired, the observers betook themselves to a respectful distance, and in a brief space of time a great upheaval occurred. The noise of the explosion, however, was in a great measure smothered When the members of the party returned to the spot, they found the stump to be rent in a most extraordinary manner; but the general opinion was that the bore-hole had been made so deep that the energy of the explosion had spent itself too much upon the subsoil and too little upon the wood. The stump next operated upon was bored to a less depth, and the result of the blasting process was more effective. In either case a few strokes with an axe, by way of severing the principal root members, would be quite sufficient to leave the woody masses in such a condition that they could easily be dragged out and lifted away. It was suggested that the operation of piercing with an auger should be dispensed with in blasting the next root stump, so as to do the work with as great economy of time as possible. In this instance, therefore, the pinch was brought into requisition instead of the auger, and by means of it a hole was driven horizontally inwards between two of the principal root-members to about the centre of the stump. The hole was charged and fired in the usual way, the result being a much greater amount of eruptive and disruptive action, with a smaller expenditure of time and labour. One or two other root-stumps of large size were blasted in the same way, and it was clearly demonstrated that, under certain circumstances, dynamite could be employed to more advantage immediately underneath rather than in the mass of material to be operated on.

The next experiments were with boulder stones, all of which were of very hard, tough, and compact whinstone. The first boulder that was tried was out in "the open." One small cartridge, properly prepared, was laid on an inclined face of the stone, then covered loosely with a sod, and fired. No rupture resulting from the shot, another was resorted to, a shallow groove on another part of the boulder being selected for laying on the charge. The latter was loosely covered, as before, and fired, and such persons as had not seen a similar experiment previously were greatly surprised at the destructive effect of the explosion, when the small amount of the charge was considered, together with the fact that no bore-hole was driven into the boulder. Other two large boulders were next attacked in an adjoining field that was being drained, the stones having being met with in digging the drains. The first of them was embedded in tolerably firm ground, and on being fired *in situ*, without any bore-hole, was almost crumbled in dust. Owing to the fact that the other boulder was embedded in a deposit of sand, the small charge of dynamite used at first seemed to have spent itself in burying it to a much greater depth in the sand; but on employing a somewhat larger charge, besides being buried still deeper in the sand, the boulder was so thoroughly broken that it might well have been used for road metal.

Mr. John Scott, of the Glasgow Canadian Land and Trust Company, after seeing the experiments, said he could use the new blasting agent with great effect and economy in land-clearing operations in Canada.—*Iron.*

A $15,000 two-set woollen mill has been erected in Winnipeg. A portion of the machinery was sent up from Galt.

THE TRANSIT OF VENUS.

No. II.

Having looked briefly at the question of a transit of Venus in its general aspect in our last article, we now pass on to review the operations that are being undertaken by England and other nations in the coming transit of December, 1874. In order to make the matter clear it is necessary to notice the features of this particular transit. We have already pointed out that occurring in December, the south pole of the earth is inclined towards the sun. Figs 1 and 2 show the hemisphere which is presented to the sun at the commencement and termination of the entire phenomenon, which will, of course, be the region of daylight. However simple it may seem, it is desirable to be quite clear about the matter. Any person looking down on these figures may note that their head occupies the position of the sun, so that an observer at any station near the centre of the map will see the phenomenon high over head, and any one near the edge will see the sun very low; for it is obvious that a figure standing on the globe at the part just turning away out of sight, would not see us over his head; on the contrary, we should appear to sink, and disappear below his horizon. Any astronomical observations suffer from the effects of refraction when made from a body near the horizon; consequently, other things equal, a station near the centre, or at all events, not near the edge of the daylight hemisphere, would be best.

Other things, however, are not equal by any means. We have to select stations so placed as to obtain the best record of the effect of parallax, in other words, that will give us the best base line, and this with respect to one of the methods we have mentioned, viz., Halley's or Delisle's. Nevertheless we may bear the principle we have enunciated in view throughout, that it is desirable not to have the sun close to the horizon; we put the matter moderately, because we shall see that the best base lines bring us towards this, in other respects, undesirable position. but the evil must be kept in view, and, if possible, avoided in its extremes in the selection of stations.

As to Halley's method, then, it has been explained that for this the entire double observation, that is, ingress and egress, must be made from the same station, the comparison of the duration of the phenomenon being the means employed to obtain the object in view. It follows, then, that stations must be taken which appear on *both* the maps we have given; next, they must, from comparison, form pairs, the members of which must differ greatly in latitude; if possible one station should be taken nearer the pole presented towards the sun, such that the commencement of the transit may be visible a little before sunset, and the night short enough to enable the termination of it to be seen after sunset. The 1874 transit may be said to last only about four hours twelve minutes of solar time, consequently the station we indicate, in spite of its lengthened duration, cannot be allowed a night of as much as four hours; which means that it must be near the edge of the region of perpetual daylight, we may say within 30 deg. of the south pole. Now the south polar continent being the only land that exists in this latitude, the observations would be made under great difficulties, and on this occasion it has been decided not to make the attempt.

In 1882, however, matters will not be better, unless more knowledge of the South Seas has been acquired so that the experiment of leaving observers to be frozen up, to live for many months on their own resources, may be made with a good prospect of the preservation of life.

We have explained how an observer, on what we may call the reverse side of the pole, gets a lengthened duration of transit by finding himself in succession in the positions of maximum acceleration and retardation. Professor Forbes in his paper gives the following as an illustration: "A person standing still sees a carriage pass between him and a distant house; the carriage will take a certain time to pass the house, but if he be also moving, and in the same direction with the carriage, the transit of the carriage will take longer, but if he move in the opposite direction to the carriage the transit will take a shorter time. If, then, two persons be seated on opposite sides of a merry-go-round, so that at the time the carriage is passing, one observer is moving with the carriage and the other in the opposite direction, then one observer will see the lines lengthened and the other shortened. Now the world is such a merry-go-round, consequently since Venus moves in a path apparently from east to west, an observer on the near