ably lowers the yield of wheat. Properly read with regard to its distribution throughout the season, the temperature of the summer months ought to guide us to a judgment with regard to the probable yield of wheat. It is the same with regard to wine. Good wheat and good wine years run together. 1868, 1870, and 1874 will probably all continue to be remembered as good wine years, and they are well known as among the best wheat years of the present half-century. In judging as to the effects of temperature upon the wheat crops, we must not only take average temperature but fluctuations between night and day. A single cold night may do incalculable damage, and a few cold days at blooming time may do much to blight a wheat-grower's prospects. Those who watch the weather closely will usually lay the foundation of a sound judgment upon wheat prospects. We require, first, a good seed time; second, a dry March; third, a hot June, July, and August. So much for the weather. We require also a good "plant," *i.e.* plenty of young wheat plants uniformly scattered over the surface. The growing crop must be fairly free from those unaccountable visitations known as "blights," both insect and vegetable, and if we can secure these good conditions we reap a good wheat crop. Let us then endeavour to apply these rules to the actual state of things during the months between seed time of 1882 and harvest of 1883, and let us glance at the various opinions expressed as to the yield of wheat for the present year in the light of these facts. First, then, we passed through a period of incessant rainfall during the time when farmers usually sow their wheat. A worse seed time we have rarely experienced. Constant rain and destructive floods were the characteristics of October, November, January, and February last. Now we owe to Sir John Lawes, in a great measure, the knowledge of the fact that a wet winter washes out that element of fertility which of all is the most important, namely, the nitrates. Here then we have to record a very wet winter, in which seeding was interrupted and nitrates were washed through into the drains and subsoil, and that to an unusual degree.

The consequence was that in the spring a thin plant was the rule upon all stiff soils. After this the wheat improved under the influence of a singularly fine spring, and farmers rejoiced in the opportunity afforded them to get on with their root cultivation. Unfortunately this state of things did not last. At the most critical period for the wheat crop summer forsook us. The nights became bitterly cold in June, and a continuation of wet weather set in which lasted almost up to harvest. Accompanying this untoward state of affairs were blights, and the ears became greatly affected with wheat-midge, smut, and ear-cockle, so that wheat-growers became sensible that their main crop was in extreme danger of ruin, and that before the papers began to publish their estimates.

This feeling among wheat-growers was quite general, as they knew that empty ears could not lead to full measures. Examination of the ears just before harvest showed clearly that small and shrivelled grains were only too common, and that many of the florets were barren. Accordingly crops were valued low, and the results from the threshing machine are bearing out the wisdom of these low valuations. As to Sir John Lawes' estimates, based on the experimental field at Rothamsted, no one knows better than Sir John that this coincidence between his average yield and that of the country generally must be liable to be upset by local disturbances. As a criterion of the harvest Sir John Lawes' field may be useful, but certainly cannot be infallible. A local frost, a local hailstorm, a local loss of plant, or faulty cultivation, must be always liable to affect any field and rob it of its general average character when compared with the harvest of millions of other acres. All this is simple truth, and in this season we are inclined to think that Sir John's field "told a flattering tale." The opinion of the writer of the present article is based, first, upon the meteorological conditions to which the wheat crop was exposed during its growth. Secondly, upon his own experience as a grower. Thirdly, upon information obtained from other growers, and from observation and reading.

He has come to the conclusion that the wheat crop of 1883 is below an average, and will be disappointing to the grower. Not only was the crop subjected to many bad conditions during its growth, but a large proportion of it was badly harvested, and is now in wretched condition. If we are not deeply disappointed with the 20 to 26 bushels of wheat per acre which our own liberally treated crops are yielding of *marketable* corn, it is because we have never expected more since those frosty nights of last June, when we resigned our hopes of a good wheat crop. The subject is almost too long for treating in a single article, and we must leave it here. If space had permitted, we should have entered upon the question as to what constitutes an average crop of wheat—a point upon which we appear to be in a state of great ignorance, unless we are to believe that an average which thousands of our best farmers have not been able to touch for the last ten or twelve years is that of the entire country with its millions of badly cultivated acres. This we cannot admit, and after a careful study of the estimates made as to average yield in various counties, we are driven to the same conclusion as that of the writer to the *Times* last Saturday, namely, that little reliance is to be placed upon them. Average, over-average, and under-average are somewhat vague terms, and difficult to fix. We can, however, base an opinion upon the fact that cheerless, cold, and wet summers that are unfavourable for fruit, bees, and vines, or even to pleasure parties, lawn tennis, and picnics, are not going to be favourable to wheat-growers. We have not touched upon barley and oats, but are prepared to allow that circumstances have been more favourable towards these crops than towards the most important cereal.

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ON A NEW METHOD OF SINKING SHAFTS IN WATERY, RUNNING GROUND

WHEN an attempt is made to sink a shaft in very watery deposits of gravel, sand, and mud in the ordinary way—that is, by digging out the solid matter by hand and pumping the water to keep the bottom dry—it is found that, after a certain depth has been reached, the current of water which flows up through the bottom brings solid matters along with it as fast as they can be removed, and further downward progress is then completely arrested. Under these circumstances it is necessary to resort to certain special methods of sinking, two of which have been hitherto employed with more or less success. According to one of these methods the shaft-lining consists of an air-tight iron cylinder fitted with an air-tight cover. When the excavation is continued below the natural level of the water, compressed air is forced into the interior of the shaft so as to drive back the water and leave the bottom dry. The workmen can then stand in the bottom and remove the solid matter by hand as easily as if the ground had been naturally free from water. The lining sinks downward as its lower end is laid bare, and is lengthened at the top as required. The pressure of the air is gradually augmented as the depth increases, but unfortunately this process cannot be carried beyond three atmospheres without prejudicially affecting the health of the workmen. When the depth of the watery running ground surpasses the limit represented by a pressure of three atmospheres, it is necessary to resort to the second method. In this case the water is allowed to stand at its natural level in the shaft, and the solid matters are removed from the bottom by a revolving dredger. The lining or casing consists of a cylinder of masonry or iron provided with an iron shoe or cutting ring, and sinks downwards at first in virtue of its own weight, being lengthened at the top as in the previous case, but after a time it generally becomes necessary to force it down by the pressure of screws, assisted by the blows of an instrument resembling a pile-driver. When it cannot be made to sink deeper, another similar cylinder of smaller diameter is introduced into its interior, the same series of operations are again gone through, and so on until the solid ground is reached.

Simple as the last described process may appear, its application is sometimes attended with difficulties of almost incredible magnitude. As an example we may mention two shafts which were sunk through about 400 feet of the kind of ground in question at the Colliery Rheinpreussen, near Ruhrort in Germany. One, begun in 1857, was not finished after more than eighteen years' constant perseverance; while the other, begun in February, 1867, was only completed down to the solid ground in June, 1872.

The new method invented by Herr Poetsch is described by Bergassessor G. Kohler in the *Berg und Hüttenmännische Zeitung*, No. 38, xlii. *Jahrgang*, September 21, 1883. It consists in freezing the water contained in that portion of the running ground which occupies the position of the intended shaft into a solid mass of ice, and then sinking through it by hand without having to pump any water. To this end a preliminary shaft of larger dimensions than the intended shaft is sunk down to the natural level of the water. A number of vertical bore-holes about one metre apart are then put down round about its sides at the bottom, so that they pass through the ground just outside the lining of the intended shaft. Others are put down within the area of the intended shaft, and one is put down in its centre. All of these bores are continued down to the bottom of the running ground. They are made by means of the sand-pump, and are lined with sheet-iron tubes in the usual way. A circular distributing pipe with small copper tubes branching from it is placed at the bottom of the preliminary shaft. One copper tube extends to the bottom of each bore-hole, and each tube is provided with a stopcock. At the surface are several ice-making machines of the Carré type. The liquid intended to circulate through the bore-holes and effect the operation of freezing consists of a solution of the chlorides of magnesium and calcium, whose freezing-point lies between $-35°$ C. and $-40°$ C. By means of a small force-pump it is made to circulate at such a rate that it leaves the cooling-trough with a temperature of about $-25°$ C. It descends into the distributing pipe, passes through the copper tubes to the bottom of the bore-holes, ascends outside the copper tubes to the top of the bore-holes, finds its way into a collecting-tube, reascends to the surface, passes through the cooling-trough, and then commences the downward journey again.

Herr Poetsch estimates that, under ordinary conditions —that is, when the outer ring of bore-holes can be made in the ground outside the lining of the intended shaft— the freezing process will occupy from ten to fourteen days.

When it has been ascertained by means of bore-holes that the wall of ice round about the intended shaft is thick enough, the operation of sinking is commenced. The ice is cut out by hand, and a descending cylinder of masonry or iron is carried down at the same time. The lining prevents the surrounding ice-wall from breaking inwards, and the bottom cannot burst upwards.

Herr Kohler made a personal inspection of this process at the shaft Archibald now being sunk to the lignite beds at Schneidlingen, in Germany. The shaft passes through a bed of running sand four metres thick. Twenty-three bore-holes were employed in two rows near its sides. The freezing process was completed on August 10 last, when the running sand had become a compact mass of such great hardness that no impression could be made on it by the finger-nail, and it was with considerable difficulty that a flake 15 mm. thick could be broken from it.

Sufficient data do not yet exist for estimating the cost of this process as compared with those already known, but we are of opinion that if the operation of freezing can be effected in two or three weeks, or even months, it will compare favourably with them in this respect under almost any circumstances. We believe also that it is capable of application under a variety of circumstances not mentioned in Herr Kohler's article, such as damming back an excessive flow of water in solid ground, driving horizontal drifts or tunnels through mud and sand, and so on. We would therefore recommend the inventor rather to turn his attention in this direction than to think of condensing the intake air of mines by the application of cold, with the view of dispensing with ventilating furnaces and enabling winding operations to be carried on in upcast as well as in downcast shafts. The former field, if we mistake not, will be a large one; the latter, we can safely promise him, will be a very small one.

WILLIAM GALLOWAY

NORDENSKJÖLD'S GREENLAND EXPEDITION

IN a series of letters to Mr. Oscar Dickson, Baron Nordenskjöld has given a detailed report of the leading incidents and results of his recent expedition, though it will still be some time ere we can learn what are the full gains to science. The leading novelty of the expedition was, of course, the journey into the interior of Greenland. We have already given some account of Dr. Nathorst's visit to the Cape York region, and in the present article will confine ourselves mainly to Nordenskjöld's own journey up the interior. We reproduce a sketch map of this journey, which Mr. Dickson has been good enough to send us. After mentioning his attempt to approach the south-east coast of Greenland, Nordenskjöld says:—

The ice much resembled the big rough blocks which are encountered north of Spitzbergen. The surface here carries a cold current which sets the ice on shore. The polar current is however not very voluminous; thus in a depth of a couple of fathoms Herr Hamberg discovered, through careful survey, a decided warm current from the south. The depth of the sea was not great, and the bottom consisted of large blocks which tore the trawling net and prevented dredging.

After landing Dr. Nathorst and his party at Waigatz Sound, Nordenskjöld went back to Egedesminde, which he reached on June 29. He then proceeds:—

The following day I left for Auleitsivik Fjord, from which my expedition was to start. This fjord is about 130 kilometres long, and very narrow in the middle, not unlike a river, which widens at the bottom into a bay, Tessiusarsoak, into which an arm of the inland ice shoots. This remarkable formation, and the great tides which favour this part of Greenland, make the navigation here very difficult. As in most of the Greenland fjords the sea is deep and free from reefs. A remarkable feature, too, is that icebergs coming athwart the narrows in the fjord cause the water in the bay suddenly to rise some ten to twenty feet. The Esquimaux relate that some years ago a boat with men, women, and dogs was drawn under here by the whirl currents. They are, in consequence, afraid of rowing in the narrows.

In 1870 I had paid a visit to this fjord and examined these difficulties, which I believed would have increased rather than otherwise during the last thirteen years, through those changes which so often occur in the position and size of the moving glaciers which shoot down from the inland ice. On inquiry I was told that no European had been in the fjord since 1870. Still my knowledge of