

lated to some extent inside the helmet but this was not found to be as detrimental in practice as some doctors anticipated. It did, however, make the helmet uncomfortable to wear for any length of time but the main point was that it efficiently stopped chlorine. This was in use until the latter part of August 1915.

About this time or slightly before, the secret service brought word that the Germans were preparing to use phosgene, against which the "Smoke Helmet" was slight protection. To meet this temporarily and to improve the protection against chlorine a new helmet was brought out, known as the "P" helmet. This kept to the use of the bag form but with several important changes. The material was changed from flannel to flannelette of a special weave and two thicknesses were used in place of one. The eyepieces were made of glass in metal frames in place of the cellulose acetate which was very liable to damage. A mouthpiece was put in with a valve so that the foul breath could be breathed out of the helmet and only fresh air gain entrance. The chemical protection was radically changed; owing to the use of a cotton fabric in place of wool it was possible to use caustic soda and with this was used phenol. The soda was used in sufficient quantity to be equivalent to the phenol and leave about 10% excess. Glycerin was added to keep the whole moist. This helmet gave very efficient protection against chlorine and was so easy to wear that it was used in practice work for an hour or more at a time without discomfort. In one attack it successfully withstood gas for over four hours. It also provided some protection against the phosgene—sufficient at least to combat any concentration which might be put over during the cold weather. This was abundantly shown when the Germans made an attack of record intensity and duration just north of Ypres on December 15, 1915.

From September on to about the end of March there was also provided an oxygen set for use of machine gunners to be used in case the gas was found to be too strong for the helmet to withstand. This apparatus consisted of a cylinder containing five cubic feet of oxygen compressed to a pressure of 120 atmospheres; this connected with a rubber-lined canvas bag from which the air was breathed. The connection from the mouth to the bag led through a can of about one quart capacity filled with caustic soda fused on coke fragments. The exhaled breath passed through this soda cartridge where the carbon dioxide was removed and the nitrogen and any unused oxygen entered the bag where it mixed with the pure oxygen from the cylinder and was re-breathed through the same channel. All breathing

was done by the mouth, nose clips being provided to prevent air entering by the nostrils. The eyes were protected by separate goggles. The apparatus was in fact a simplified form of the Proto Salvus mine rescue sets which are in common use in the coal mines of England. It had sufficient oxygen to supply a man for about an hour and was only to be used as a last resort. Fortunately these sets were never required.

But although the "P" helmet would withstand the phosgene as it could be put across in the winter it was not considered sufficient to provide adequate safety against the amounts which might be used in summer. After investigation by some of the best chemists of England the additional protection was provided by adding to the chemicals a certain proportion of Hexamethylenetetramine or Hexamine. The helmet was then known as a "PH" helmet. This was very satisfactory except for one thing; when exposed to gas, the ammonia of the hexamine was used up and set free the formaldehyde. Of course, formaldehyde in the proportion encountered in this way is not poisonous but it would bring tears to the eyes after ten or fifteen minutes and there was danger that men on smelling the formaldehyde would mistake it for gas and think the helmet was leaking. They might then try to change to a fresh helmet and be gassed in doing so if not able to keep quite cool and hold their breath during the change. Later on a small change was made in the construction whereby rubber sponges were put inside the eyepieces making a joint which prevented the formaldehyde reaching the eyes and also furnished protection against tear shells. This form, known as the "PHG" helmet was in use up to October when another type entirely different was introduced but it is best not to say anything of this later one yet.

None of these respirators, with the exception of the PHG, furnished much protection against the tear shells. They would keep out sufficient of the Xylol Bromide vapor to prevent any throat irritation but still enough penetrated to affect the eyes. Protection was given by close fitting goggles of impervious cotton lined with flannel, the windows were of cellulose acetate. These were moderately good if not used too long but they could not be put on while wearing the helmet in gas. If the helmet was put on over the goggles protection was complete but there was so much in front of the eyes that gunners could set their fuses or see their sights only with difficulty in daytime and practically not at all at night.

About March a special respirator was issued for machine gunners, artillerymen and signallers which avoided these difficulties. This was known as the

"Box" or "Tower" respirator. It consisted essentially of a tin box containing the protective chemicals and a breathing tube so arranged with valves that the incoming breath came through the box of chemicals while the exhaled air went direct to the atmosphere. The face piece was a mask of many layers of gauze wet with zinc hexamine and sodium sulphite and fitted only over the nose and under the chin with a nose clip and a mouth piece which led to the tube connection of the box. Just outside this face piece or "snout" was a rubber valve similar to that on the helmets, which opened when the breath was exhaled. The reason for this kind of facepiece was that it was necessary to allow for the necessity of speaking or giving orders which could not be done with anything that fitted the mouth too closely. The joint of the mask with the face could not be absolutely depended upon so the mask was made to give some protection in itself without being made impervious; at the same time men were particularly warned to depend as far as possible only on the air obtained through the box. The box itself contained three layers—one of soda lime and potassium permanganate, one of animal charcoal and the third of sodium sulphite with a negative catalytic agent to retard the oxidation. When in use the box was carried in a special haversack slung on the chest and connected with the face piece by a flexible tube. This respirator furnished air which was very comfortable to breathe, removing practically everything except oxygen and nitrogen. Protection for the eyes was given by a separate pair of rubber sponge goggles similar to those which were later incorporated in the PHG helmet. The two parts could be used either together or separately and could be put on in whatever order was convenient.

The German respirator is an impervious mask enclosing the whole face and includes both eyepieces and breathing connections. The breath passes both ways through a small box containing clay, charcoal and potassium carbonate. The chemical protection is sufficient but the design is faulty. A large proportion of exhaled air is re-breathed at each inspiration with consequent discomfort and besides the line joint necessary in any form of mask is always liable to leak especially when on a person with a face at all angular. The German respirator would be quite satisfactory if one only had to sit quiet and breath but is both uncomfortable and unsafe if any movement is required.

Summing it all up, although the Germans started the gas business the British have developed the protection to a higher degree and have moreover been able to at least equal if not exceed them in offensive gas work.

## The British Columbia Farm Loan Act Calculated to Increase the Agricultural Production of the Province

Many applications have already been filed with the Agricultural Credit Commission by the farmers of British Columbia for loans to make improvements to their farms, such as clearing, draining, the erection of buildings, and the purchase of stock—all calculated to increase the agricultural production.

The agricultural act was placed upon the statutes of British Columbia in March, 1915. It authorized the borrowing of \$15,000,000 to be administered by a commission, the debentures of the said commission to be guaranteed by the government of the Province. A loan of \$1,000,000 was obtained under the act and cost 5.63 per cent. This is being loaned to the farmers at 6.5 per cent.

Long-term loans for 20, 30, and 36½ years may be made on the amortization plan, interest and principal payable half-yearly. Short-term loans may be made from 3 to 10 years, which need not be amortizable.

### Preference in Granting Loans.

A great many applications are being received where the money is wanted for paying off existing mortgages. The policy of the commission, with the limited amount of money at its disposal, is to give first consideration to applications where the money is to be used for purposes that will tend definitely to increase agricultural production; therefore the applications for money to be used exclusively to pay off mortgages are being held in abeyance for the time being.

The system is yet new in British Columbia, consequently statistical information is limited. The following figures, however, may be of interest:

Items.	Number.	Average amount.	Total amount.
Applications for loans received to date . . . . .	1,400	\$1,554	\$2,175,455
Applications appraised to date . . . . .	464	2,324	1,078,605
Loans granted . . . . .	144	1,628	234,430
Applications withdrawn . . . . .	7	2,369	16,575
Applications refused . . . . .	142	2,425	334,405
Applications held over for further consideration . . . . .	121	3,078	372,450

### Terms of Loans.

Of the 144 loans granted 5 were for \$250, 2 for \$300, 21 for \$500, 2 for \$600, 3 for \$750, 2 for \$800, 2 for \$850, 26 for \$1,000, 4 for \$1,200, 12 for \$1,250, 1 for \$1,300, 16 for \$1,500, 4 for \$1,800, 16 for \$2,000 1 for \$2,280, 8 for \$2,500, 4 for \$3,000, 2 for \$3,500, 4 for \$4,000, 1 for \$4,250, 6 for \$5,000, 1 for \$5,500, and 1 for \$8,000. By length of time these loans are distributed thus: Straight loans—3-year, 3; 5-year, 28; amortizable loans—7-year, 1; 8-year, 3; 9-year, 1; 10-year, 42; 20-year, 14; 36½-year, 20.

The half-yearly repayments on loans, interest, and principal included, are as follows per \$1,000: On a 3-year loan, \$186; 4-year, \$145; 5-year, \$119; 6-year, \$102; 7-year, \$90.25; 8-year, \$81.25; 9-year, \$74.25; 10-year, \$69; 20-year, \$45; 30-year, \$38.25; 36½-year, \$36.

The commission has five appraisers in the field in the various parts of the Province, and every effort is being made to complete the work of appraising before the winter weather sets in. The appraisal fees charged are: For loans of \$500 or less, \$2.50; from \$500 to \$1,250, \$5; from \$1,250 to \$2,500, \$7.50; from \$2,500 to \$10,000, \$10.

## CANADA'S WHITE PINE IN DANGER.

The highly valuable white pine forests of Ontario, Quebec and New Brunswick are in danger of extinction by the outbreak of 'white pine blister rust,' a disease originally brought over from Germany on pine seedlings, according to a bulletin issued by the Canadian Forestry Association.

Infected areas have been located in Ontario, in the Niagara Peninsula, and in Simcoe, Durham, Wellington and Victoria counties. In Quebec, several outbreaks have been found near Montreal. An investigation has been under way for some months by provincial Government officers, but to prevent another disastrous visitation of disease, such as cleared off most of the tamarack and chestnut trees, the most vigorous measures will have to be taken by all governments, lumber companies, and individuals.

The disease spreads through gooseberry and currant bushes which are used as a 'host' plant. The rust forms yellow patches on the under side of the leaves, then develops late in June into spores on the currants and berries and is carried by the wind to the white pine. No preventive is known, other than destruction of the two kinds of berry bushes and all five-needled trees found to be infected. The governments of the Eastern States have made appropriations for an immediate campaign to locate diseased sections and to suppress the infection.

## HALIFAX BONDS SOLD.

The City Council has accepted the tender of R. M. Grant and Company, of Boston, for a civic bond issue of \$265,228 at \$8.5963. This was the best of eleven tenders from various firms. A slightly better tender was seven by Nesbitt Thompson and Company, Montreal, but as it was only for a part of the amount, \$130,000, the Boston tender was taken.