if blown out into an explosive atmosphere, would be extremely liable to ignite it, whilst although the combustible gases evolved are reduced in quantity they are not done away with. Besides nitro-glycerine and nitro-cotton, such of the Sprengel explosives as are capable of complete detonation come under this group. The Sprengel explosives have been largely used for blasting purposes, both abroad and in this country; those used here consist of mixtures of nitrated hydrocarbons and ammonium nitrate. Roburite, introduced by Dr. Carl Roth, is a simple mixture of nitrate of ammonium with chlorinated meta-di-nitrobenzol. The ammonium nitrate is first dried and ground, then heated in a closed steam-jacketed vessel to a temperature of 80 degs. Cent., and the melted organic compound is added, and the whole stirred until an intimate mixture is obtained. On cooling, the yellow powder is ready for use, and is stored in airtight canisters, or is made up into cartridges. Owing to the deliquescent nature of the ammonium nitrate, the finished explosive must be kept out of contact with the atmosphere, and for this reason the cartridges are waterproofed by dipping them in melted wax. This mixture is not exploded by ordinary percussion, firing, or electric sparks. If a layer of the explosive is struck a heavy blow with a hammer, the portion directly receiving the blow is decomposed, owing to the heat developed, but no detonation whatever takes place, nor are those portions of the substance around the spot in any way affected, whilst if roburite be mixed with gunpowder and the gunpowder be then ignited, the latter explodes and scatters the roburite without firing it. The roburite can only be exploded by a specially powerful detonator, and on decomposition the gases evolved contain no combustible constituents, but consist only of carbon dioxide, water and nitrogen, with a small trace of hydrochloric acid gas, which is at once condensed by the large volume of water vapor evolved, and gives rise to no inconvenience. Ammonite is another explosive of this class, which is manufactured from ammonium nitrate and dinitronapthalene, these substances being blended in the proportions to give as the products of combustion carbon dioxide, water vapor and nitrogen, but during the decomposition taking place, probably some more complex action occurs, as small traces of ammonia can generally be detected. Bellite consists of a mixture of dinitro-benzene with ammonium nitrate, the latter being kept rather in excess. Securite consists of ammonium nitrate and dinitro-benzene, but from the proportion of nitrate used it is probable that carbon monoxide is produced. These cartridges are coated with nitrated resin, in order to protect them from the action of the atmosphere. There is no doubt but that this group of explosives approach more nearly to real safety explosives than any which have yet been introduced. The low temperature of explosion secured by the use of ammonium nitrate, the absence of any combustible products of decomposition—except perhaps with securite—and the fact that both the oxidizing material and the combustible are capable of complete detonation with a sufficiently powerful fuse, give these explosives enormous advantages over any others to be obtained, whilst they are absolutely safe in handling. The safety of the Sprengel explosives in handling and use is to a large extent dependent upon the fact that when the mixture of ammonium nitrate and the nitrated organic body is ignited by ordinary flame, the ammonium nitrate requires a large amount of heat for its decomposition, in order to render the oxygen which it contains available for the combustion of the carbon and hydrogen in the organic body, and the temperature of the burning substance is not sufficiently high to propagate this action throughout the mass, the result being that to cause continued combustion you must have a continuous supply of heat, or the flame first started simply dies out. The effect of this is that in handling, such bodies are practically non-inflammable, and when they are made to explode by detonation, a more than usually powerful detonator has to be employed, so that although with nitro-glycerine mixtures a charge of 7 grains of mercuric fulminate is amply sufficient to produce detonation, such a body as roburite needs at least 15 grains. Moreover, when detonation has been produced, the amount of heat absorbed by the decomposition of the ammonium nitrate causes a very considerable lowering of the temperature of explosion. To the writer's mind it is an absolute *sine qua non* that in an explosive mixture for mining work, all the constituents should be capable of detonation, and the reason for this is that under these conditions the shock of the detonator resolves both the oxidizing and combustible bodies into their respective molecules, and that these then recombine into the gaseous forms which give the explosive force, the whole action being practically instantaneous, and causing the projection of the hot products with such velocity as to give no time for the decomposition of the methane in the pit gas, and the ignition of its constituents. In order to obtain the requisite rapidity of explosion to ensure safety as regards the ignition of gaseous mixtures in the pit, the reacting portions of the explosive must be in the condition of molecular division, and for blasting purposes this can only be obtained by complete detonation. It is impossible to obtain safety by any attempt at mechanical division. An excellent example of this failure of mechanical means is to be seen in westphalite, which is made by mixing 95 per cent. of ammonium nitrate with 5 per cent. of shellac or resin dissolved in alcohol; the alcohol is driven off by heat, and the mixture is ground and made up into cartridges. In this mixture the resin or shellac cannot be detonated, and the presence of the inert material necessitates the use of a No. 9 detonator, containing 2.5 to 3 grains of fulminate, to explode the mixture, and when detonated the ammonium nitrate only is decomposed, and the simple combustion of the resinous matter by the products follows as a secondary reaction, with the result that the period of explosion is very sensibly increased, and the risk of the ignition of the pit gases becomes much greater. The resinous material undergoing combustion is also a source of danger, as, instead of being in a molecular state of division, the smallness of the particles is governed by the degree of fineness to which it is ground, and a blown-out shot would be accompanied by a shower of sparks of the burning resin. The fine condition into which it must be ground must also increase the troubles due to the hygroscopic nature of the ammonium nitrate. In deciding as to the relative claims of the other members of the Sprengel group, ammonium nitrate being common to all, the best will be the one in which the nitrated combustible is the most susceptible to detonation, as this reduces the chance of mis-fires or partial detonation as well as increases the rapidity of explosion, and the writer should expect the chloro-dinitro-benzol used in roburite to answer best to this requirement.

The third group of explosives consists of mixtures of the first and second groups, in which a body susceptible to detonation, and generally of an oxidizing character, is exploded and the products made to act upon a combustible. Westphalite is an admirable example of this group, but the most important member is carbonite, which consists of a mixture of about twenty-five parts of nitro-glycerine, thirty parts of nitrate of pottassium, four parts of nitrate of barium, forty parts of wood meal, and one of carbonate of sodium. On detonation the nitro-glycerine is decomposed and combustion of the wood meal at the expense of some of the oxygen of the nitro-glycerine and the metallic nitrates takes place. There is no doubt that the admixture of so large a proportion of carbonaceous material reduces the temperature of the explosion, but it also makes it one of the worst offenders as regards the generation of combustible products, and if carbonite be exploded in an experimental bomb, the escaping gases can be ignited and will burn with a characteristic carbon monoxide flame, over 40 per cent. of the products of its combustion consisting of this gas. So far carbonite has come out in trials and in practice in a very satisfactory manner, but a blown-out shot in a dusty mine would be quite likely to lead to an explosion, whilst the fumes must be very injurious to health.

For the reasons which the writer has brought before the members, he thinks the selection of a safety explosive should be based upon the following points:—(1) The explosion must be due to detonation and not to simple combustion; (2) if the explosive be a mixture, both the combustible and oxidizing material must be susceptible of detonation; (3) the products of explosion must be non-inflammable and non-poisonous; (4) the explosive must be safe in handling as well as in action, and compounds of an unstable character which are liable to change should be avoided; (5) the temperature of explosion should be as low as is compatible with rapidity of action. The following table gives an idea of how far the explosives most in use comply with these requirements, and it will be seen that the Sprengel explosives occupy the foremost place:—

Mining Explosives.

Name.	How exploded.	Products of explosion.	
		Combustible.	Non-combustible.
Gunpowder	Combustion	14	86
Blasting powder	"	42	58
Nitro-glycerine	Detonation	*nil*	100
Nitro-cotton	"	61	39
Gelignite	" and combustion.	7	93
Carbonite	" " "	41	59
Roburite	"	*nil*	100
Ammonite	"	*nil*	100
Bellite	"	*nil*	100
Securite	"	trace	100
Blasting gelatine	"	46	54
Tonite	" and combustion.	8	92
Westphalite	" " "	trace	100

Given an explosive which answers to these requirements, and using electric firing, with detonators containing sufficient fulminate unmixed with chlorate of potash, to ensure complete detonation, ought to reduce accidents from explosives to a minimum.

The Slocan District, B. C.

The Editor:

SIR,—The district especially under consideration is that portion of the British Columbian Selkirks which lies between the Kootenay and Slocan lakes. Of this district, the mountains drained by the creeks flowing into the east side of Slocan Lake have, so far, been found to be the best mineralized. In the formations which surround the Carpenter Creek and its three branches, the great majority of the producing silver mines are situated. These are usually galena, silver bearing, within a calciferous slate formation, or in the near neighborhood of such rock. Some few mines carry dry ores of silver, but these are more often found in the granites or the crystalline rocks which make up the massive formation of this district. When so found, the silver occurs as native silver, ruby silver, sulphide of silver, grey copper carrying silver, and other combinations less readily determined.

In 1891 the first movement was made into this country, and this being before the last fall or "slump" in silver, caused some considerable excitement and progress. Since that time prospecting and development have gone steadily on, as there are here bodies of ore so rich that it still pays well to mine them.

This summer a large amount of work is being done towards increasing the ease of getting out the ore, whereby mines which formerly had to pack in supplies and pack out ore several miles, will now be able to construct tramways down to the railroads, or, at least, short waggon roads, thus making their mines more profitable, and producers all the year round, which was not the case before, for but little ore was shipped after the snow season of the winter.

Dealing more particularly with the ore-producing mines, the galena-silver properties take the lead, chiefly because they are of greater body and extent, giving more encouragement to mining companies to work permanently, but besides this, until the prospecting of the present season, the richer leads carrying dry silver ores and gold, had not been discovered.

Concerning the producing mines of the Slocan, tributary to the Nakusp and Slocan railway, the following is a quotation from the New Denver *Ledge*:—

"From the initial shipment of September 13th, till January 1st, 1895, the Slocan mines sent out over the Nakusp and Slocan railway:—

	Tons.	Valued at.
Alpha mine	771¼	$ 77,125
Mountain Chief	91¼	9,125
Slocan Star	1031½	103,150
Fisher Maiden	47¾	4,775
Noble Five	87	8,750
Minnesota Silver Co	15	1,500
Reco	42¼	4,225
Idaho	60	6,000
Last Chance	15	1,500

This does not include the heaviest shipments made by the Concentrator Co., of Three Forks, who handled some 6,000 odd tons during the winter.

Also, it will be seen that the values given above are simply nominal, being the customs valuations upon these ores which are shipped mainly to the Omaha smelters.

Besides these mines many small shipments were made from properties worked in a small way by the original locaters. Their output being heavily handicapped by the high rates for pack animals and feed.

Since May active work has been going forward in the opening up of this district by the extension and improvement of roads already built, and by the construction of the Kaslo and Slocan railway, a narrow guage line which taps the Slocan Star and Cody Creek group, and gives the ore an outlet by way of Kootenay Lake at Kaslo, twenty-five miles eastward. The C. P. R. also is now engaged in building an electric tramway from Three Forks to Sandon, to draw ore from the same rich mines.