Correspondence.

The Extermination of the Buffalo.

To the Editor of the SCIENTIFIC AMERICAN:

After perusing "The Crime of a Century," written by Prof. Charles Frederick Holder, published in the SCIENTIFIC AMERICAN of December 9, 1899, I am of the opinion that his article is a product of sympathy and love of natural existence. There is no doubt that had the Professor gone deeper into the question of extermination, he would have arrived at an entirely different conclusion. I will endeavor to correct some of the errors of Eastern antiquarian sympathizers by giving, from a practical and scientific standpoint, the opinion of men who have watched the decline and fall of the bovine race, and noted the progress of westward expansion.

From the authority of an army officer, Prof. Holder, speaking of the buffalo, said, "If any one had told me then that in twenty or thirty years they would have become almost entirely extinct, I should have regarded the statement as that of an insane person." Had he said, "If any one had told me then that in twenty or thirty years those vast plains would have become peopled by the human race, laid out in homesteads and ranches, with a church on every hill-top, and a school in every valley," who would not have regarded the statement as that of an insane person?

In obedience to the philosophy of the survival of the fittest, the van of Western emigrants sounded the knell of the buffalo herds.

After considering the treatment of a few army officers, by being corraled for days and weeks on the open plain or in some gulch, or of some Kansas Pacific train derailed by their terrible onslaughts, what rational mind could look with favor on a great herd of probably a million buffalo charging madly upon every settlement and line of fence from Minnesota to Texas? Think of a million buffalo on their semi-annual migratory tours charging through your own country with their rank and file extending in every direction as far as your eyes can behold, your buildings, gardens and fields ground to dust beneath their myriad feet, your wives and children fleeing for protection at the sound of their approach. I wonder how the professor would like to have the pleasure of witnessing such a spectacle from the heights of the Catskill Mountains. Yet, such would have been the condition of affairs on the Western plain to-day had not the buffalo been exterminated. Had he not succumbed to the crack of the sportsman's rifle, his doom would have been sealed a short time later, when man came to dispute his claims.

After the buffalo had performed his act in aiding and assisting in the development of the country, his skin paid the expenses of his removal. Some may ask: Why was he not domesticated? In a country where land produces from 40 to 100 bushels of corn, and 1 acre of pasture land would put on 200 to 400 pounds of beef in a year, would it pay to raise animals whose chief value lies in their covering, estimated at $2.50 to $5? No! Decidedly no! Their domestication would have proved unprofitable.

On the broad prairies, stretching from the Mississippi River to the foothills of the Rockies, there exists in a state of domestication a race of animals far superior to the buffalo in quantity and ability to supply the wants of mankind. Where once roamed unfettered the pioneer of the prairies, now graze in quietude countless flocks of sheep and herds of cattle. Enough buffalos still remain for museum purposes.

If the Professor desires to witness a specimen of the successor of the buffalo, I refer him to Armour Rose, a Hereford heifer that sold at Kansas City for $2,500. She holds the place of one extinct buffalo. In the study of the history of human progress, when any animal becomes useless or inferior to other animals of its class and species, it is not only natural, but right, that their race give way to the survival of the fittest. A moderately small herd of buffalo on the Missouri River would be as entirely out of place as a band of Comanches turned loose on the Hudson.

The white man, by his industry, energy, and superior mental ability, has robbed the Indian of his birthright. No rational mind can entertain any other conception than that the buffalo were exterminated in direct obedience to the laws of nature. Their extermination was not a crime, but a necessity.

Ford City, Mo. GERALD LIVERGOOD.

A Decision Affecting Forfeited Applications.

The Court of Appeals of the District of Columbia has held, in the case of Christensen v. Noyes (C. D. Ms. Dec. 472), that where an applicant has permitted his application to become forfeited by failure to pay the final fee within the time prescribed by law, but has subsequently renewed the same, the constructive reduction to practice afforded by the filing of the original application will not defeat a patent granted to another before the renewal, upon an application filed subsequently to the filing of the original application, where the subsequent applicant was the first to conceive the invention and was also the first to actually reduce the same to practice. Applicants should therefore be careful not to allow their applications to become forfeited after allowance, but should see to it that their applications are diligently prosecuted until the final grant of the Letters Patent.

THE EXPLOSIVE SIDE OF ACETYLENE.

BY FREDERICK H. M'GAHIE.

In a recent number of the SCIENTIFIC AMERICAN SUPPLEMENT, the writer gave, under this heading, a summary of the facts that scientific investigation had determined in regard to the explosive properties of pure acetylene and its mixtures with air. These experiments have given the limits within which the new illuminant must be produced and utilized to avoid dangerous and uneconomical conditions. Some cases deviating from those treated possess much interest in having found practical application and having been studied from the point of view of possible explosion. Special burners have to be used with pure acetylene, as the ordinary ones do not give satisfaction with regard to illumination or economy. There is a deficiency in the supply of oxygen afforded by their construction, and combustion with them is not sufficiently complete to give rise to the temperature needed to carry to incandescence the large amount of carbon contained in acetylene. The first solution consisted in making the burners with holes permitting air to be drawn in and mixed with the acetylene just before combustion (Fig. 1). Such would act satisfactorily for a time and then begin to clog up and give a weakened, smoky flame. By adding 15 to 30 per cent by volume of nitrogen to acetylene, Bullier was able to employ ordinary burners. Others have proposed carbon monoxide, carbon dioxide, hydrogen, water-gas, as diluting agents. Of these, Prof. V. B. Lewes, Gas Engineer for the City of London Authorities, has stated: "The great trouble which has presented itself in diluting acetylene with any cheap diluent is that the illuminating power of acetylene is reduced to an enormous extent, and it has been found that hydrogen, carbon monoxide, and water-gas are useless for this purpose, as 10 per cent of acetylene mixed with either of them gives a practically

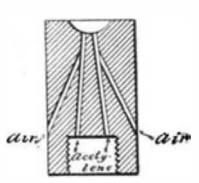

Fig. 1.

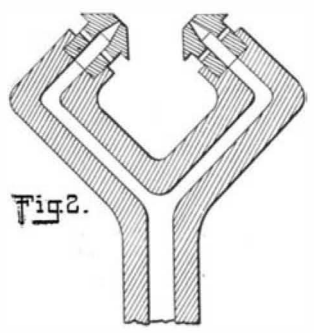
Fig. 2.

non-luminous flame, while if the acetylene is used in sufficient quantity to give a satisfactory light, the percentage of acetylene needed is too high to be commercially possible."

Prof. Lewes made a long series of experiments to discover a cheap diluent that "would maintain the enrichment value of acetylene at something near the value of the gas when burned alone." His conclusions were that "methane was the only gas that would do the work required, and further that the presence of 30 per cent of methane when mixed with hydrogen, carbon monoxide, or water-gas converted it into an excellent diluent, with which 10 per cent of acetylene gave a 20 candle-power gas capable of being burned in ordinary gas fittings." He found that each 10 per cent of diluting gas mixed with acetylene raised the temperature necessary to originate explosion 180° F. The practical value of this investigation lies from our point of view in the fact that a mixture containing enough acetylene to make a brilliant illuminant for railroad lighting can be compressed and utilized safely, since the temperature needed to cause explosion is high enough to melt the metal cylinders carrying the compressed gas. Such a system has been introduced with satisfaction on the street railways in Prussia. The preliminary tests were made by the Julius Pintsch Company, of Berlin, and the Prussian railway management in common. The conclusions of Berthelot and Vieille in regard to the explosiveness of acetylene were confirmed by these experiments. A tank was filled with acetylene at six atmospheres pressure, and a small pipe entering the tank was brought at a point 59 inches from the tank to a red heat by a gas flame. A violent explosion followed. Another tank was filled with acetylene at a pressure under two atmospheres and a pipe heated as before at a point 59 inches from the tank to a white heat. Local decomposition took place in the pipe, but no explosion occurred. With mixtures of 30 per cent acetylene and Pintsch oil gas or coal gas compressed to as high a degree as was desirable, it was found that the fusible solder used in the joints of the tank would melt long before a temperature involving explosion of the compressed gas could be reached, and, further, that explosion did not result from heating highly the pipes leading to tanks so filled.

For the small generator involved in the lighting of country houses by acetylene, the above methods are not available, and pure acetylene must be burned to secure a maximum simplicity of system. There are now satisfactory burners based on the principles of the one shown in Fig. 2. The escaping acetylene draws in air for mixing with itself, and the two jets impinge upon each other to form a vertical flame at a distance from the burner sufficient to avoid the overheating of the tops, with the consequent formation of the condensed polymers of acetylene, such as C_6H_6, C_8H_8, that causes smokiness and clogging up with the burners of Fig. 1 type. It has been proposed to mix air in proper porpbrtions for good combustion in usual gas fixtures with the acetylene after its generation and a simple apparatus to this effect has been patented by Dickerson. But it involves an element of danger in introducing an explosive mixture into the distributing part of the system. The air can be mixed with the acetylene all right in the small passages of the burner, since the explosive laws of large masses do not hold in small tubes. Le Chatelier found that in tubes with diameter not exceeding 0 02 inch any mixture of air and acetylene would not propagate explosion. The influence of the diameter of tubes is shown in this table determined by him:

Diameter.	Inferior Limit of Inflammability.	Superior Limit of Inflammability.
	Percentage Acetylene.	Percentage Acetylene.
0·03 inches,	7·7	10
0·08 "	5·0	15
0·78 "	3·5	55
1·57 "	2·9	64

There are some who hold that compressed, and even liquefied, acetylene has a future. For compressed acetylene gas Claude and Hess have brought forward a method possessing distinct advantages, that of dissolving acetylene in acetone. At 60° F. acetone dissolves about 26 grammes of acetylene per liter, for each atmosphere of pressure, the factor decreasing with elevation of temperature. Berthelot and Vieille investigated this case to determine the conditions of explosion. They found that the acetylene gas above the liquid acted the same as pure acetylene and would, therefore, detonate by a spark at two atmospheres and above. At pressures up to 10 atmospheres, the acetylene dissolved in the acetone will not explode either through the detonation of the free gas or through the action of a highly incandescent wire placed in the liquid. Above 10 atmospheres a danger region is approached. In experiments at 20 atmospheres pressure inflammation of the free gas gave rise to an explosive pressure of 550 atmospheres. Since the decomposition of acetylene at 20 atmospheres would give around 200 atmospheres pressure, it is evident part of the dissolved acetylene participated in the action. When the inflammation was provoked by an incandescent wire in the liquid part, a pressure of about 5,000 atmospheres was observed. In using cylinders charged according to this system it is imperative to take into account the fact that the pressure increases rapidly with the temperature. In the charged cylinder experimented with, a pressure of 6·5 atmospheres at 57° F. became respectively 8·4 atmospheres at 80° F., 10·2 at mospheresat 96° F. and 15·8 atmospheres at 140° F. It is desirable then in using acetylene dissolved in acetone to fix the charging pressure at 7 to 10 atmospheres calculated for 60° F. in order to obviate the danger of charged cylinders reaching through exposure to the sun or through being in the vicinity of some source of heat a pressure at which the dissolved acetone would take part in any explosive decomposition. These figures have been given to exhibit the great increase of storage capacity afforded by the system. A cylinder of one liter capacity carrying 0·7 liter of acetone saturated with acetylene at 7 atmospheres pressure will carry 127 grammes of acetylene. The same cylinder will contain but 11 grammes of acetylene gas compressed to 10 atmospheres. If explosion should occur in the free gas of a cylinder properly charged, the maximum pressure obtainable would be below the safety limit of the cylinders employed and the dissolved acetylene would be still available. The advocates of this acetone-acetylene method hold that it gives an excellent solution of the problem of storing acetylene in a condensed state in cylinders for subsequent transportation to any place where it is desired to feed a receiver, that it is more economical and safe than acetylene compressed in the ordinary manner, and that it is practically free from all danger in the hands of the skilled workmen who would handle the cylinders. Those who believe in the possibilities of liquefied acetylene have invented valves which make it impossible for ignorant workmen to open them too quickly and to bring about thereby the danger of adiabatic compression in the gaseous column to a degree involving explosion.

THE French government is building four submarine boats of the "Goubet" type. Several submarine boats of the type of the "Narval" are also to be constructed if the trials which are now in progress prove satisfactory.