There are many applications of fluor spar, some of which we purpose to give in this article.

ALUM FROM FELDSPAR.

The manufacture of alum and other compounds of potash from feldspar has long been regarded as a desirable thing; this result can be obtained for alum by fusing the feldspar with fluor spar and treating the mass with sulphuric acid. In this way the silica is expelled in combination with the fluorine as hydro-fluosilicic acid, and the sulphuric acid unites with the alumina and potash of the feldspar to produce alum, while the lime of the fluor spar being insoluble can be collected on filters or removed by decantation, in the form of gypsum. O[redacted]ash salts can be produced from the alum.

HYDRO-FLUOSILICIC ACID.

Gay-Lussac observed many years ago, that when fluor spar and silica were fused together, some of the fluorine combines with the silicon in the form of fluoride of silicon, and escapes with the gaseous products of combustion. Many attempts were made to save this gas, but without success, until Tessie du Motay constructed a furnace by which, it is claimed, that 68 per cent of the fluoride is economized. Plans of the furnace were shown at the Paris Exhibition of 1867, together with a large suite of salts prepared by means of the hydro-fluosilicic acid. Among these salts we recall pure caustic potash, carbonate of potash, silico fluoride of potassium, silico fluoride of sodium, silico fluoride of barium, and caustic soda. As many of our ores contain fluor spar, and as, in the process of smelting, the fluorine is expelled, it is well worth while to save the incidental product of fluoride of silicon by conducting it into water and converting it into hydro-fluosilicic acid. This latter acid has many applications in the arts, and if we could obtain it cheaply and in abundance, it would prove of great value. It has been recommended for the decomposition of bones and guanos; for the manufacture of artificial stones; for fixing colors in paintings with soluble glass; for the preparation of pure tartaric acid, by removing the potash from tartars; to remove lime and potash from the juice of beet-root; and in some of the operations in the manufacture of pins.

HYDROFLUORIC ACID.

For etching on glass, fluoric acid has long been employed, and for this purpose it can be readily prepared by pouring sulphuric acid upon pulverized fluor spar. The operation must be conducted at a gentle heat, in a leaden or platinum retort. When required pure, the latter metal is indispensable. It is, also, sometimes customary to pass the gas through ammonia or potash to produce the fluorides of ammonium or potassium, also to be used for etching glass or for the resolution of minerals.

It is proper to state in this connection, that great precautions must be observed in handling hydrofluoric acid. The preparation of the gas is attended with great danger, as it attacks violently the organs of respiration. A drop of the acid on the skin produces fearful ulcers, and on the tongue, instant death. In a concentrated state it must be preserved in platinum bottles, and in a dilute form, can be kept in gutta-percha bottles.

FLUOR SPAR AS A FLUX.

It has been observed that lime alone occasions a loss of 5 or 6 per cent of iron, in blast furnaces, and that a small addition of fluor spar remedies this evil, as it keeps the slag more uniformly liquid, so that the iron is not caught in it, but falls rapidly through it, and the slag can, by blowing out the furnace, be more easily removed than when other flux is used. The fluor spar also prevents the formation of graphite and removes phosphorus. The proper proportion is about 50 lbs. to 100 lbs. pig iron, or 40 lbs. to 100 lbs. spiegel iron. A larger quantity might prove injurious to the walls of the furnace. In small crucible operations, fluor spar can be recommended as a valuable flux, and in blow-pipe analysis it has a similar application. [See page 229, Vol. XIX., letter of S. D. Poole, Lynn, Mass.]

PREPARATION OF ALUMINUM AND MAGNESIUM.

Metallic aluminum has been made by fusing the double chloride of aluminum and sodium with a proper proportion of metallic sodium, but the actual operation is attended with some practical difficulties, which are said to be removed by the addition of fluor spar. The mixture usually taken is composed of 100 parts double chloride of aluminum and sodium, 50 parts fluor spar, and 20 parts sodium. These substances are intimately mixed and introduced upon the hearth of a furnace previously heated to redness. The doors of the furnace are closed while a strong heat is brought to bear, and by occasional stirring the metallic aluminum will flow down to the front of the inclined hearth. By permitting the more fluid portion of the flux to run away, some fluoride of aluminum can be saved as an incidental product. Magnesium can be prepared in a similar manner by fusing 600 parts chloride of magnesium, 480 parts fluor spar, and 230 parts sodium, in a suitable crucible. The sodium must be freed from naphtha and cut into small pieces so as to be intimately mixed with the chloride and fluor spar, it is then projected into a crucible previously heated to redness, and the cover held down during the first stormy reaction by an iron weight. The magnesium will be found scattered through the slag in small bright pellets, from which it can be separated by crushing and washing.

HYDRAULIC CEMENT.

It is not an easy thing to graduate the heat in the preparation of hydraulic cement so as to prevent the formation of hard slag. By mixing fluor spar with the limestone, a greater range of heat is found to be admissible, and a second burning can be obviated and the properties of the cement are said to be improved.

An excellent cement can also be made by fusing feldspar, lime, and fluor spar together, and separating the potash by dissolving in water. This has the additional merit of securing a most valuable incidental product in the potash.

ANTOZONITE.

A variety of fluor spar has been discovered in Germany, which, on the application of heat, gives off an odor that forcibly recalls chlorine, and, twenty years ago, was supposed to contain that gas. Schoenbein considers the odor to be due to a modified form of oxygen which he calls antozone, and he names this variety of the fluor spar antozonite. A French chemist, also, takes the ground that fluor spar contains oxygen. If either of these theories could be proved by experiment, other and important uses would be opened up to this mineral.

SEPARATING GOLD AND SILVER.

The Stevens flux, for treating mineral ores, is essentially fluor spar, obtained in the treatment of cryolite for soda, and there is, consequently, nothing particularly new about it. According to experiments conducted by Dr. Chandler, of the School of Mines, Columbia College, the amount of fluor spar required in the working of gold quartz is very large, often one hundred per cent, so that the economy of the process must depend upon the cost of the fluor spar at the mines. It is doubtful if fluor spar can be economically employed on a large scale in treating gold quartz. In the working of titaniferous iron ores it now has considerable employment, and may add to the value of that class of ores.

The above are some of the uses to which fluor spar can be applied, from which it will be apparent that it is a valuable mineral, worthy of the attention of metallurgists and manufacturers everywhere.

THE INCREASED USE OF COLD-ROLLED SHAFTING.

The use of cold-rolled shafting is, so far as we can learn, steadily increasing, and its application to purposes where exactitude of diameter, superior strength and rigidity, as well as the highest perfection of finish is required, has now become very extensive.

For our own part we have certainly never seen anything in the way of shafting, superior in point of elegance of finish to this product of cold-rolling.

This beautiful finish, however, is not gained at a sacrifice of strength as might be supposed by those unacquainted with the process, as the following table of results obtained in experiments performed by Major William Wade, of the United States Department, will show.

We may also state that similar tests were made by John P. Whipple, Chief Engineer, U. S. N., and William Fairbairn, Esq., Manchester, England, with like results.

The table is a summary of the average results obtained from numerous experiments made with bar iron, rolled while hot, in the usual manner, compared with the results obtained from the same kinds of iron, rolled and polished while cold, by Lauth's patent process, as manufactured by Jones & Laughlins, of Pittsburgh, Pa., whose advertisement will be found in another column.

	Iron rolled while		Ratio of increase by cold rolling.	Average rate per cent of increase.
	Hot.	Cold.		
TRANSVERSE—Bars supported at both ends, load applied in the middle, distance between the supports 30 inches.				
Weight, which gives a permanent set of one tenth of an inch, viz.: 1½ in. square bars.	3,100	10,700	3,451	162½
Round bars, 2 in. dia.	5,200	11,100	2,134	
Round bars, 2¼ "	6,800	15,600	[illegible]	
TORSION—Weight which gives a permanent set of one deg., applied at 25 in. from center of bars.				
Round bars, 1¾ in. diameter, and nine in. between the clamps	750	1,725	2,300	130
COMPRESSION—Weight which gives a depression, and a permanent set of one hundredth of an inch, to columns 1½ inch long and ⅝ in. in diameter	13,000	34,000	2,615	161½
Weight which bends, and gives a permanent set, to columns 8 in. long and ¾ in. diameter; viz.: Puddled iron	21,000	31,000	1,476	64
Charcoal bloom iron	20,500	37,000	1,801	
TENSION—Weight per square inch, which caused rods ¾ in. dia. to stretch and take a permanent set, viz.: Puddled iron	37,250	[illegible]	[illegible]	95
Charcoal bloom iron	42,439	[illegible]	[illegible]	
Weight, per square in., at which the same rods broke, viz.: Puddled iron	55,760	83,156	1,491	[illegible]
Charcoal bloom iron	50,927	99,293	1,950	
HARDNESS—Weight required to produce equal indentations	5,000	7,500	1,500	50

NOTE.—Indentations made by equal weights, in the center, and near the edges of the fresh cut ends of the bars, were equal; showing that the iron was as hard in the center of the bars as elsewhere.

SCIENTIFIC INTELLIGENCE.

SEPARATION OF ANIMAL AND VEGETABLE FIBER.

M. Shervord has invented an ingenious method for the separation of animal fiber from vegetable. The process does not alter the structure or color of the animal fiber, and permits the use of cotton and linen fiber separated from it for numerous purposes. It is sufficient to suspend the goods in an atmosphere of nitrogen or carbonic acid, and to cause the vapors of perfectly dry sulphuric, phosphoric, or hydrochloric acid to enter the room. These fumes disintegrate the vegetable fiber and leave intact the animal—the two fibers can thus be separated and appropriated to their respective uses.

CLEANING ENGRAVINGS.

It very often happens that fine steel engravings get stained with moisture on the wall, or specked with mildew, and it becomes an important question how to bleach them. One of the best methods is to moisten them carefully and suspend them in a large vessel partially filled with ozone. The ozone bleaches them perfectly without attacking the fiber of the paper.

For the evolution of ozone the simplest way would be to clean pieces of phosphorus and place them, half covered with water, in the bottom of the jar in which the pictures are suspended. On a large scale, a Ruhmkorff coil and constant discharge of electricity would be preferable. It is somewhat surprising that this method of cleaning fibers has not been more generally applied.

INFLUENCE OF FORESTS UPON RAIN.

The London *Athenæum* contains another example of the influence of forests upon the quantity of rain. In several districts of Australia there is a perfect rage for cutting down timber, and where this devastation has been carried out, the quantity of water that falls in a year has greatly diminished; from 37 inches in 1863 it has decreased to 17 inches in 1868. In 1869, from January to July, comprising two of the wet months, there only fell 11 inches of rain.

In Victoria the want of water is becoming a serious question, and the Government has been compelled to appoint an inspector of forests intrusted with the duty of preserving the trees already existing, and to establish nurseries for young sprouts wherever admissible. By a judicious planting and preservation of forests it is anticipated that a decided improvement can be effected in the climate of the country.

The residents of New England, who permit the mountains to be stripped of their trees for the production of charcoal, would do well to consider at what a cost to the water power of the States, to the fertility of the farms, to the climate of the country, and to the health of the community, all this momentary gain is attained. While other governments are planting trees at great expense, they are cutting them down to obtain a few chaldrons of charcoal.

MORIN'S EXPERIMENTS UPON THE PUNCHING OF METALS.

General Morin, one of the ablest of French engineers, and who has given to the world one of the best treatises on mechanics extant, has been extending his investigations to the determination of the power expended in the punching of metals and plastic substances.

The results of a large number of experiments are given by him in a paper read before a recent session of the Academy of Sciences, Paris, which demonstrate that the same elements of resistance enter into the operation of punching as in that of shearing. In short, a punch and die may be considered as a shears with circular blades. The coefficient of pressure in punching, per any given area of section, will be exactly that for shearing the same area of section, without reference to the thickness of the material.

The measure of force, necessary to effect the various punchings easily gives the value of the resistance to shearing, in case of the ordinary metals. This resistance (per square meter) is determined to be, for

	Kil.
Lead	1,820,000
Block tin	2,090,000
Alloy of lead and tin	3,390,000
Zinc	9,000,000
Copper	18,930,000
Iron	37,570,000

It is difficult to give these figures in exact denominations of English measures and weights. A square meter is 1·196 square yards, nearly; and a kilogramme is, approximately, 2·205 lbs. avoirdupois.

THE GREAT UNION DEPOT ON FOURTH AVENUE, NEW YORK.

The contract for this enormous structure has been finally awarded to the Architectural Iron Works at the foot of Fourteenth street, New York. The depot is intended to accommodate the trains of the Harlem, Hudson River, and New York Central Railroads. For the latter a branch road will be built to connect with the Harlem, the trains being switched off in the neighborhood of Spuyten Duyvil. The car house will have accommodations for twelve single trains, while, if it be necessary, double or even treble that number can be accommodated.

Photographs of the plans and drawings were sent to Europe for bids, but it was found that American founderymen could more than compete with any bids received abroad.

The foundation of this immense structure, to be the largest of the kind on this continent, is well under way—in fact, nearly completed. The contract calls for the completion of the entire structure within eight months from its date. If not completed within the time specified, the contractor is to forfeit and have deducted from the contract price $500 a day for every day over; and if completed within the time specified, the contracter is to receive, in addition to the contract price, the sum of $200 for each day the work is so completed and accepted by the engineer.

The weight of iron to be used will be over 8,000,000 pounds. It will require 100,000 square feet of glass in the roof alone, and 90,000 square feet of galvanized corrugated iron to cover the roof. The roof over the car-house will extend over an area limited south and west by the office buildings, east by the Fourth avenue, and north by a line 30 feet 6 inches south of Forty-fifth street. The entire length of the roof will be 652 feet, and it will be 199 feet 2 inches in width between the walls, and supported by 32 arched trusses, placed 20 feet four inches apart. These great arches will be set upon the foundation, whose upper face is 2 feet below the surface of the ground, rising to an elevation of 94 feet from the springing line to the extrados of the arch.

The car-house is to be lighted through three skylights extending over the entire length of the roof—one on the center, double pitched, and two single ones on each side of the center. The rewill be seven courses of ventilators running the entire length of the roof, faced up with stationary sheet iron slats.