Steam Plate-shears.—A set of plate-shears recently supplied to Messrs. Colville & Co., Motherwell, by Messrs. Lamberton & Co., which are considered to embody some improvements, are worthy of note. They were designed for cutting plates 2 inches thick at a gap of 37 inches. It was concluded that the ordinary form of cast-iron standard could not be relied upon to resist the strain on the material round the region of so wide a gap; hence the special design was adopted. The standards are formed of several pieces, which are bound firmly together by large steel bolts, 13 inches diameter, passing from top to bottom of the machine. In the act of shearing the whole strain is taken by these bolts, which are considered to be much more reliable than any mass of cast-iron in the form of standards could possibly be. The engines are coupled and reversing, and of sufficient power to start the cut from rest. Rams are also provided for holding the plate firmly down on the bolster during the shearing.

Hydraulic Plate-shears.—Recently doubts have arisen whether steam-driven shears are the most suitable for the heaviest class of work, and consideration has been given to the use of hydraulic power for this purpose. By one of those curious coincidences which not unfrequently occur, two or three minds appear to have conceived simultaneously the application of hydraulic power in almost identical form. In a set of hydraulic shears designed by Mr. Lamberton the same general construction of standard is used as in the steam shears just described. But motion is imparted to the cutting blade through toggle arms attached to a main crank-shaft, whereon are keyed two levers, which in turn are connected to the rams of two hydraulic cylinders. Pressure in a hydraulic cylinder counterbalances the weight of the apron, and ensures the return of the rams in the main cylinders when the valve is open to the exhaust. The special feature in this machine is that by a special arrangement the parallelism of the cutting blade is maintained throughout the whole length of a cut, which may be as long as 12 feet or 15 feet to meet modern requirements. Designs for a hydraulic shearing machine embodying the same principle and in almost identical form have also been recently submitted to the author by Mr. Wicksteed.

A powerful shearing machine which Messrs. Beardmore are having constructed appears also to be on the same lines, but with some novelties in construction which are of interest. It is of massive design, and is capable of shearing mild steel plates up to 2½ inches thick. The cheeks or standards each consist of two steel plates 14 feet by 9½ feet by 6 inches, which are separated by a cast-steel distance piece, so as to stand about 13½ feet apart from centre to centre. The gap is 37 inches wide from the edge of the bolster, and is quite open at both ends of the machine, so that a 2½ inch plate 6 feet broad and of any length can be split from end to end with ease. The motive power is supplied by two cast-steel hydraulic cylinders, 20½ inches internal diameter by 4½ feet stroke, firmly snugged and bolted to the back of the cheeks. The ram of each cylinder is in the form of a trunk piston, to which is secured a mild steel connecting rod. The water, under a pressure of 700 lbs. per square inch acts on an area of 330 square inches on the under side of each ram, while there is a constant back pressure of 700 lb. per square inch on an annular area of 47 square inches on the upper side of the ram, thereby enabling the blade to be lifted when the pressure on the lower side of the ram is relieved. The effective pressure on the lower side of each ram is thus 88½ tons. The hydraulic pressure is transmitted from each ram to the blade or apron through a lever having a mechanical advantage of three to one. Both levers are rigidly keyed to one common shaft, 18 inches diameter and 18 feet long, which passes from end to end of the machine, and is supported by cast-steel brass-lined bearings passing through the cheeks and bolted firmly to them. Any tendency to thrust the blade endwise will be resisted by the torsional rigidity of the main shaft. The total pressure therefore transmitted to the blade at any instant is upwards of 530 tons; and, as the cutting edge has an inclination of 1 in 9, the intensity of pressure per square inch on the section of, say, a 2 inch plate in the process of being sheared, will be approximately 30 tons, which allows an ample margin for friction in the working parts. While the plate is being sheared it is held steadily against the bolster by three small hydraulic cylinders, which together exert a pressure of 10 tons, and are bolted firmly to the front guide of the machine. Arrangements are under consideration whereby a mild-steel plate of any dimensions and of thickness up to 2 inches can be taken from the mill-house floor, sheared on all four edges, and deposited again on the floor, with the aid of only one man and a boy.

It is a question worthy of consideration whether plates of such great thickness should be subjected to shearing. Familiarity with the use of mild steel has removed the nervousness which led in its earlier days to the exercise of great care in its treatment. It is now the axiom that in good work steel plates should not be punched; or, if they be, then rimering must follow to remove the injured portions around the hole. Shearing is detrimental to the edges of plates, especially when the shearing blades are in bad order; and the injury is greater with such thick plates as those under consideration, and should be removed by subsequent planing. These considerations induced the author to hesitate in adopting the shearing process for thick plates, and rather to prefer ripping machines for the purpose, thus avoiding the injury, although at a slightly increased cost.

Hydraulic Forging-press Cylinder.—Hammers, which since the introduction of cogging mills have fallen into desuetude for making steel slabs to be rolled into plates, are also being gradually displaced for other work by the increasing use of hydraulic forging presses; and in connection with the construction of a most powerful press, Messrs. Beardmore have taken a step which it may be of interest to mention. The cylinder is of nickel steel, and is probably the heaviest piece yet cast of this material, certainly in the form of a difficult casting. The weight of the casting with head is 64 tons, and the finished weight of the cylinder will be 42 tons. A test of the actual casting has not yet been made; but a portion of the charge was run into an ingot 23 inches by 18 inches, then cogged down to a billet 5 inches by 7 inches, and from this the following test results were obtained: Tensile strength, 40·1 tons per square inch; elongation in 8 inches length, 20 per cent.; elastic limit, 55·8 per cent. of tensile strength; contraction of area, 43·4 per cent.; and Lloyd's bending test was stood without fracture. This product of Messrs. Beardmore's skill and enterprise is peculiarly interesting to the author, seeing that it confirms his expectation of the service which nickel steel may render to engineering work.

Le Roi Mining and Smelting Co. has declared a dividend of 5 cents per share on the 18th inst. This company has now thoroughly developed the property and it may safely be assumed that dividends will be of frequent occurrence. The Le Roi, as said before, has been thoroughly developed, the company has put in expensive machinery, hoists, air compressors, etc., which are all paid for, and now as the product is nearly 100 tons daily the stockholders are bound to be benefitted. A Sullivan diamond drill to be worked by electricity was recently ordered. This will be used to further prospect the properties owned by the company.

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Pumice Stone.—Some interesting details respecting this useful mineral may be found in the report furnished by Mr. Norman Douglas to the Foreign Office. Pumice, as is well known, is of volcanic origin, being a trachytic lava which has been rendered light by the escape of gases when in a molten state. It is found on most of the shores of the Tyrrhenian Sea and elsewhere, but is at present almost exclusively obtained from the little island of Lipari. Most of the volcanoes of Lipari have ejected pumaceous rocks, but the best stone is all the product of one mountain, Monte Chirica, nearly two thousand feet in height, with its two accessory craters. The district in which the pumice is excavated covers an area of three square miles. It has been calculated that about one thousand hands are engaged in this industry, six hundred of whom are employed in extracting the mineaal. Pumice is brought to the surface in large blocks or in baskets, and is carried thus either to the neighboring villiage, or to the seashore, to be taken there in boats. The supply is said to be practically inexhaustible. Pumice is used not merely for scouring and cleansing purposes, but also for polishing in numerous trades, hence the fact that the powdered pumice exported exceeds in weight the block pumice. Between twenty and thirty merchants are engaged in the pumice trade in the island. Prices rose considerably about seven years ago, when a syndicate, with a capital of £20,000, rented the municipal pumice lands. The syndicate, however, failed through mismanagement, and, since then, though the good qualities always command a high figure, the general tendency of prices has been to fall.

Prevention of Mine Accidents.

At a meeting of the Federated Institute of Mining and Mechanical Engineers, held at Newcastle, England, a prize paper was read by Mr. Austin Kirkup on the means of preventing accidents in coal mines. Dealing first with explosions in mines, from fire-damp and coal dust, he said that, as far as now known, gas and coal dust were the only agents for producing explosions in mines; and to dilute the one with air and to destroy the other was the only method of rendering them harmless. The most explosive mixture of gas and air was in the proportion of one of gas to 9.4 of air, and the least explosive was one of gas to 15 of air. When more air was added, the mixture became unexplosive, and therefore harmless so far as the presence of lights was concerned. Hence the first requirement of every fiery mine was a sufficient ventilation to dilute and render harmless noxious gases to such an extent that the working places of the shafts, levels, stables, and workings of the mine should be in a fit state for working and passing therein. He laid stress on the necessity of good airways. Many mines were at a disadvantage in this respect. In some cases the shafts were too small, but more often it was the underground roads, more especially the return airways. These roads were not usually intended for haulage and travelling, and were allowed to get into a bad state. The sectional area was in many parts very small. Acute bends were frequent, and where faults were met with, the air in many cases was deflected from an horizontal to a vertical course. In order to ensure good results, the sectional area of the return airways should be equal to that of the intake airways, sharp bends should be avoided as much as possible, the abruptness of faults should be smoothed down, and the air should have as easy and straight a road as possible to the upcast. The accumulation of gas in old workings should be guarded against by a system of thorough inspection; where gas is being evolved in old workings which cannot be ventilated it should not be stopped off; the workings should be placed in connection with the return airways, so that the gas as it is generated may expand into them and be diluted by the current.

With reference to safety lamps, the writer thought that in addition to being examined, they should be tested in coal gas and air before being locked and sent into the mine. Fire-damp detectors he considered useful for ascertaining the proportion of gas present in the main return airways of a fiery mine, more especially when the ventilation is produced by a furnace-fed—as in the majority of cases—by the return air current. An ordinary safety lamp will only detect gas when the proportion of gas in the current is 2 per cent. or more, and when it is remembered that it is unsafe to fire shots in a dusty mine in air containing 2 per cent. of gas, it will be seen that the systematic use of a fire-damp detector in a fiery mine may in many instances reveal hidden dangers. It seems probable that, as fire-damp detectors become better known, they will no longer be regarded as scientific toys, seeing that they give such reliable indications of the state of the return air currents. The writer has already alluded to the property of coal dust, whereby an explosion may be extended far beyond the limits of the gas. It is also an undoubted fact that under certain conditions coal dust mixed with air alone will produce an explosion. These conditions are seldom attained except during the process of shot-firing, although instances are on record of dust taking fire on the screens on the surface. The fiery blast from a shot-hole in the presence of coal dust is increased by the combustion of the dust particles, and where sufficient dust is present to feed the flame a blast of explosive violence is formed which often extends for long distances. When small proportions of gas are present in such dust-laden air, the initiation and extension of an explosion is facilitated.

The commonest cause, almost the only cause of dust explosion, is the occurrence of a blown-out shot. This is generally due to the injudicious choice of a shot-hole, combined with the use of too great a weight of explosive and too short a length of stemming. Blown-out shots should be, as far as possible, prevented, and the sole way of doing so, that occurs to the writer, is to employ only such officials at this work as are thoroughly qualified by experience and intelligence to calculate the correct position of a shot-hole and the weight of explosive necessary to do the desired amount of work. The last point in relation to shot-firing is the use of blasting powder in dusty mines. In many mines its use has been abolished; in many more it should be abolished. It produces a heavy shower of sparks and flame, which are most favorable for the initiation of an explosion. Only such explosives should be used as will give a minimum of flame, and devices for the extinction of flame in shot holes should be more resorted to. There are many more proposals for the prevention of accidents in mines from explosions which the writer might have dealt with, such as the compulsory use of safety lamps in all mines, the abolition of all underground fires, boiler fires, furnace or otherwise, and the abolition of blasting in all mines. For the most part they will not bear criticism, for it goes without saying that before abolishing a useful agent we should find something equally good to put in its place.