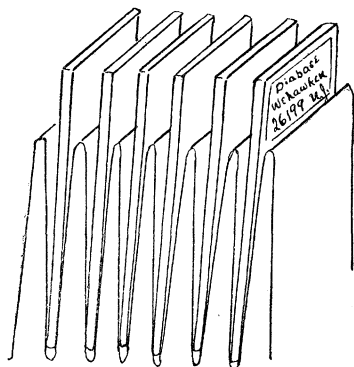


As it happened, we had in stock a number of paste-board boxes some 93 millimeters wide, 143 millimeters long, and 48 millimeters deep, all inside measurements. The dimensions of our standard slide are 48 x 28 millimeters. By means of two wooden partitions, some 3 millimeters thick, running lengthwise, each box was divided into three equal compartments, the partitions being held in place by glue reinforced by two small tacks at each end. Heavy Manilla wrapping paper, such as we also had in stock, was then cut into strips 25 millimeters wide and as long as the sheet of paper would allow, in this case about 7 feet. These strips were then bent into a series of folds, as shown in the accompanying illustration, the apices being rounded, not pinched flat. If carefully done, the folds when crowded gently together act as a spring. Two of these folded strips were then placed lengthwise in each compartment, and the slides introduced, standing on end, between the folds at the top. A box as thus prepared readily holds three rows of 50 slides in a row, or 150 altogether.

Each slide is separated from its neighbor in the same row by a double thickness of Manilla paper, which, owing to its manner of folding, acts as a spring, and avoids all possible danger of breakage. When all the compartments are filled, the space between the tops of the slides in any row is but about 2 millimeters; but there is, nevertheless, no difficulty in removing a slide or in getting at it to read the label without removal, since, owing to the yielding nature of the paper, the tops may be readily drawn apart. In this respect the box offers a great advantage over



those with rigid wooden compartments, such as are commonly in use. The first box was made merely as an experiment. It proved so satisfactory that, for the time being at least, it is the form adopted for storing the several thousand slides forming the museum collections.

I have attempted to show the arrangement as above described in the accompanying drawing. In reality the slides are held much more firmly than indicated, since the paper bulges and comes against both the front and back of the slides, the full length of the fold, instead of merely at the bottom. It will very likely strike the reader that a better material than paper might be found. I can only state that after considerable experimenting the paper was, all things considered, found most satisfactory.

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SPONTANEOUS COMBUSTION IN MINES.¹

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THE lecturer remarked that most of the difficulties of a mine could be overcome in certain well-known ways: water could be raised by pumping-engines; gas carried away by ventilation, and the danger obviated by safety lamps; but spontaneous combustion, in some cases, could not be prevented, and, when once begun, could not always be stopped, except by filling the pit with water.

¹ Summary of a lecture on the 10th of October last, at the Philosophical Hall, Leeds.

Spontaneous ignition of coal was well known to ship-owners and insurance companies, large cargoes of coal being especially liable to take fire upon long journeys. In the same way, a great heap of coal on the surface was liable to take fire, especially if it was small coal or slack. For that reason it was necessary in storing slack not to have the heaps too wide or deep. A heap ten feet deep might not fire, while a heap twenty feet deep of the same coal would be very liable to fire. A small heap of slack laid against the outside of a boiler-flue or steam-pipe would probably take fire in a short time. Heaps of slack and broken coal left in the mine were very liable to take fire, and much smaller quantities would fire in the mine than on the surface, because it was warmer underground, and the superincumbent strata upon the slack and broken coal prevent the heat from escaping. Spontaneous ignition was very frequent in the thick coal-miles of South Staffordshire, Warwickshire, and Leicestershire, and it was necessary that these pits should be watched every hour of the day and night lest a fire, having broken out, should obtain the mastery before it was discovered. If a fire was detected whilst yet smouldering, the heated material is dug out if possible and the place filled with sand. Sometimes the fire was extinguished by pumping water onto it. In some mines water was laid on at a high pressure for the purpose of throwing jets of water onto any fire that may occur. It was usual, however, in mines liable to spontaneous combustion, to separate the district containing the waste heaps of slack or broken coal from the rest of the mine by means of walls or dams of brick and clay and sand, so that the smouldering fire, producing carbonic acid gas, extinguishes itself by its own smoke. Sometimes an apparently solid mass of coal took fire. In this case the apparently solid coal has been cracked and crushed, and air has been able to enter into the cracks to support combustion. In mines liable to this species of accident, the manager has a very anxious time, and his deputies must unceasingly patrol the pit. Sometimes it was impossible to isolate a fire, owing to air drawing through cracks in the pillars of coal surrounding the fire, and the men were beaten back by the flames, and had to abandon the mine. The shafts were then partially filled and covered so as to exclude the air, and in the course of three or four months it generally happened that the fire was extinguished.

The cause of these fires was perhaps not entirely explained. It used to be supposed that the decomposition of the sulphuret of iron, called iron pyrites, produced heat sufficient. This idea was, however, now abandoned by the leading chemists who had studied the question. Sir Frederick Abel and Dr. Percy, in a report to the Royal Commission in 1875 on the "Spontaneous Combustion of Coal in Ships," suggested the decomposition of the coal as the probable cause. Professor Vivian B. Lewes, in 1892, contributed a paper to the Society of Arts, in which he stated, as the result of the work of Richters and himself, that newly-cut coal would absorb oxygen to the extent, in some cases, of three times its own volume. This oxygen produced a kind of slow combustion, and, where the heat could not escape, the temperature of the mine was raised to that of 800° to 900° F., and at this temperature, if there was any air near to the coal, it would take fire.

There were only two ways, apparently, of preventing this spontaneous combustion. One was to cool the heap by ventilation. But the ventilation to be efficient must be equal to that of a coal-heap on the surface, and it was known that a heap of small coal twenty feet thick and thirty or forty feet wide was very liable to take fire; therefore, if the heap of coal in a mine was to be cooled by ventilation, the ventilating roads would have to be not much more than fifteen feet apart, and a cool current of air through each. This, as a general rule, was impracticable; and therefore, as a general rule, the prevention of spontaneous ignition by ventilation was impracticable. The other method was to exclude the air from the mass of coal that was liable to fire by means of walls of soft clay or by walls of brick and mortar and sand, or solid pillars of coal. The portion of the mine so walled off might get very hot, raising the temperature of the mine ten or twenty degrees above the normal temperature of the earth; but it could not take fire if the air was excluded.