Fighting Dust with Dust

Powdered Stone to Prevent Coal Mine Explosions

By John B. C. Kershaw

General view of the Experimental Explosion Station, showing the 7½-foot gallery.

THE SCIENTIFIC AMERICAN SUPPLEMENT of August 23rd last, contained the reprint of a paper upon the "Effects of Incombustible Dusts on the Explosion of Gases," read by Prof. Harold B. Dixon, F.R.S., and Colin Campbell, M.Sc., before the Manchester (Eng.) section of the Society of Chemical Industry. The investigations described in this paper had their origin in the proposal to use stone or slate dust in coal mines, in order to minimize or prevent the dangerous explosions of coal dust, which have been proved to add greatly to the devastating effects of fire-damp explosions in dry and dusty mines. The objection had been raised (based on some experiments carried out by Sir Frederick Abel in 1881-1882) that incombustible dust such as stone or slate dust would *add to*, rather than *minimize* the dangers of explosion in mines, because catalytic action would come into play, and would accelerate the rate of the chemical combustion of the carbon-monoxide or methane with the oxygen of the air.

The investigations referred to by Dixon and Campbell proved conclusively that Sir Frederick Abel had drawn wrong conclusions from the results of his experiments in 1881-1882, and that the presence of incombustible dust in a mine, so far from accelerating the rate of combustion, exerted a cooling and quenching effect on the flame. The use of such dusts in coal mines cannot therefore add to the danger or intensity of fire damp explosions.

Since Dixon and Campbell's paper was published, the fifth report of the Explosions in Mines Committee has been published,¹ and as this contains very important recommendations and proposals regarding the use of stone dust in mines, certain of the "conclusions" arrived at by the committee are given below:

"A slowly traveling inflammation, such as is produced when a ready-made dust cloud is ignited by a large jet of gas (unaccompanied by concussion) is at first capable of licking up coal dust deposited upon the surface of an incombustible dust and propagating itself for some distance until sufficient violence is developed to raise the incombustible dust also; and this raising of the incombustible dust is more readily effected when a lighter or more buoyant dust, such as flue dust or fuller's earth, is employed, both coal and incombustible dust being raised in suspension together, and the flame soon dying down."

"Incombustible dust is more effective in preventing the ignition of coal dust than

in checking an inflammation that has started. It should, therefore, be distributed uniformly throughout those galleries of the mine subject to the danger of coal dust ignition, and if maintained in the proportion of between one and two parts by weight of incombustible dust to one of coal dust, the chances of such ignition taking place would be very small. Even a small proportion of incombustible dust (20 or 30 per cent by weight) has a marked effect in checking an incipient inflammation.

"The disposal of incombustible dust in zones, or in easily disturbed masses concentrated in certain posi-

tions, leaving portions of the roads untreated, is, *we think, not likely to be effective.*

"In the case of mild inflammation, an incombustible dust that is readily raised and floats in the air, has been found to be more effective than one which, owing to its shape or density, is less buoyant.

"Shale dusts, or even heavier dusts, such as sand, are, however, effective, when sufficient violence has been attained to raise them in suspension in the air."

Having thus formulated the conclusions, which appear to follow from their experiments at Eskmaels and elsewhere, the committee make some practical suggestions, and here again it will be best to quote their report:

"It must be distinctly understood that our experiments have traversed, as yet, only a portion of the subject, and that what we propose is advanced as a provisional precaution which may be found on further experience to need extension. But since these experiments have clearly shown the great difficulty of initiating an explosion in a gallery where the coal dust has been mixed with an easily raised incombustible dust, so that the mixture contained at least 50 per cent of incombustible material, we are confident that the dust in a mine so treated would be relatively safe from ordinary ignitions, and consequently that the chance of a disastrous explosion would be greatly diminished."

Since this admixture with 50 per cent of incombustible matter, which can be carried out in a simple and practical way, confers on coal dust such power of resisting inflammation, it might be, in our opinion, most usefully adopted now, even if further experiments may lead to extensions, or other methods be found more efficient.

We think therefore that, as an alternative to watering, the treatment of coal dust by an incombustible dust—so as to maintain an excess of incombustible matter in the mixed dust—might be adopted as fulfilling the requirements of the English Coal Mines Act of 1911.

By Section 62 (3) and (4) of that Act it is enacted that:

"The floor, roof and sides of the roads shall be systematically cleared so as to prevent, as far as practicable, coal dust accumulating; and . . . systematic steps, either by way of watering or otherwise . . . shall be taken to prevent explosions of coal dust occurring or being carried along the roads. Such a systematic step

(Concluded on page 294.)

Free end of the gallery during a test.

Junction of the 7½-foot gallery with one 3 feet 2 inches in diameter.

¹ Cd. 7,132. Date, October 22nd, 1913.

Want your share of that \$60,000,000 fund?

If you're a policyholder in any old-line life-insurance company (except one), you've contributed to an annual fund for agency-expense which in 1912 amounted to more than \$60,000,000.

You'll never get your contribution back or any part of it—now; but you need never pay it out again—you can save it—if you will steer clear of life-insurance agents and deal direct with the one non-agency institution in America—the Postal Life Insurance Company.

THE Company's Health Bureau also performs a most important service in health-conservation by issuing timely Health Bulletins for the benefit of its policyholders, and by providing for those who so desire, one free medical examination each year—a privilege not accorded by any other company.

It will thus be seen that the Postal Life Saves You Money and Safeguards Your Health.

It will be well worth your while to find out just what the Company will do for you on any standard form of policy—whole life, limited-payment life, endowment, joint-life, monthly-income, or child's welfare. For quick action simply write and say:

"Mail full insurance particulars for my age as per advertisement in SCIENTIFIC AMERICAN for April 1," and be sure to give

1. Your Full Name.
 2. Your Occupation.
 3. The exact Date of Birth.
- The Company will promptly send you (by mail only) figures for your age with the amount of dividends guaranteed; also additional policy dividends now being paid, showing the Postal's low net cost.

No agent will be sent to visit you; the Company does not employ agents. By dealing direct, you get the benefit of the commission other companies pay the agent.

POSTAL LIFE INSURANCE COMPANY
WM. R. MALONE, President
35 Nassau Street New York

STRONG POSTAL POINTS

First: Standard policy-reserves, now nearly \$10,000,000. Insurance in force nearly \$50,000,000.

Second: Old-line legal-reserve insurance—not fraternal or assessment.

Third: Standard policy-provisions, approved by the State Insurance Department.

Fourth: Operates under strict State requirements and subject to the United States Postal Authorities.

Fifth: High medical standards in the selection of risks.

Sixth: Policyholders' Health Bureau arranges one free medical examination each year, if desired.

The first cost of a Mullins Boat the last cost. Outside of painting, they cost nothing to keep in commission—Never need new ribs—Never need new planks—Never need caulking. Designed by expert Naval Architects. Guaranteed Absolutely against Penetration—Built of heavily galvanized, tough steel plates like Government Torpedo Boats—Fitted with airtight compartments like Life Boats. Equipped with Sterling 4-Cycle and Pierce-Budd and

MULLINS STEEL BOATS CAN'T SINK

Ferro 2-Cycle Motors—Never stall—Never balk—Exhaustlessly under water—For Safety, Speed, Comfort and Enjoyment there's nothing can equal a Mullins Boat. Send for beautiful book illustrated in color. It's Free. The W. H. MULLINS CO. The World's Largest Boat Builders, 118 Franklin St., Salem, O.

Scientifically and Practically THE UNDERWOOD Represents Supremacy

Proofs:

Holds Elliott-Cresson scientific medal for supremacy of mechanical construction.

Holds every record for Speed, Accuracy, Stability.

UNDERWOOD

"The Machine You Will Eventually Buy"

Fighting Dust With Dust

(Concluded from page 290.)

as is laid down in the above clause would be taken, in our opinion, if the roads were treated with incombustible dust.

"It should be clearly understood that in recommending this limit of 50 per cent of ash we are putting it forward provisionally and as a minimum."

In closing this brief account of the present position in the United Kingdom with regard to the use of stone dust in mines, a few particulars of the Experimental Explosion Station at Eskmaels, in Cumberland, may be given, also some details of the constitution of the committee in charge of the experimental work.

The experiments were commenced by the Mining Association of Great Britain, at Altofts Colliery, Normanton, Yorks, in 1908. The result of these experiments was to prove beyond all doubt the truth of the theory that coal dust suspended in the air was capable of being ignited without the aid of any inflammable gas, and was, therefore, capable of propagating an explosion through the dusty galleries of coal mines.

The official record of these experiments, and of the conclusion based upon them, is contained in the *Proceedings* of the Mining Association of Great Britain, for the year 1910. In that year, the Mining Association approached the Royal Commission on Mines with the view of ascertaining whether the government would be prepared to continue the experiments at the public cost, and offered to lend to the government the experimental plant and apparatus that they had accumulated at Altofts. This proposal was communicated to His Majesty's government, which ultimately undertook to find the funds necessary for the purpose. An executive committee to carry out the experiments was appointed by the Secretary of State for the Home Department, consisting of Sir Henry Cunynghame, chairman; Mr. R. A. S. Redmayne, Capt. A. H. P. Desborough, Prof. H. B. Dixon, and Mr. W. C. Blackett. The members of the Royal Commission on Mines, together with the Coal Dust Committee of the Mining Association already referred to, were constituted as a Consultative Committee. The first meeting of the Executive Committee was held at the Home Office on May 11th, 1911.

The site at Altofts being no longer available, it became necessary to seek a new one. An endeavor was made to secure a suitable locality which should be at a fairly equal distance from the various coal fields in England, Scotland, and Wales, which should be remote from dwellings, and at the same time should be near a railway so as to afford convenient access for heavy material. After the examination of numerous sites a piece of land on the sea was chosen, near Eskmaels, in the county of Cumberland, adjoining the gun-range of Messrs. Vickers. The works are surrounded by sand hills. The space available for a gallery measures 600 yards in length from the eastern side of the seashore. The large gallery (7 feet 6 inches) has been removed from Altofts, and has been placed east and west, so as to point seaward, and it now extends to a length of 800 feet.

A smaller gallery, 3 feet in diameter and 400 feet long, has been fixed alongside the large gallery for the purpose of making comparative experiments, and the number of recording instruments for following the course of the explosions has been accordingly increased.

The writer's thanks are due to Prof. Harold Dixon, F.R.S., a member of the Home Office Committee, in charge of the experimental work, and also to Dr. Wheeler, the chemist in charge of the tests at Eskmaels, for their co-operation in obtaining photographs and information for use in this article.

The Water-drop as a Microscope

(Concluded from page 288.)

the lens, thus limiting the diameter of the hole, which can successfully be used to hold the drop, and the magnifying power of the lens possible with any given holder. The magnifying power may, however, be increased by using a smaller holder, since

LEGAL NOTICES

INVENTORS are invited to communicate with Munn & Co., 361 Broadway, New York, or 625 F Street, Washington, D. C., in regard to securing valid patent protection for their Inventions, Trade-Marks and Copyrights registered. Design Patents and Foreign Patents secured.

A Free Opinion as to the probable patentability of an invention will be readily given to any inventor furnishing us with a model or sketch and a brief description of the device in question. All communications are strictly confidential. Our Hand-Book on Patents will be sent free on request.

Ours is the Oldest agency for securing patents; it was established over sixty-five years ago.

All patents secured through us are described without cost to patentee in the *Scientific American*.

MUNN & CO., 361 Broadway, New York
Branch Office 625 F St., Washington, D. C.

Classified Advertisements

Advertising in this column is 75 cents a line. No less than four nor more than 12 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance.

AGENTS WANTED

300 to 400% Profit to Agents selling our guaranteed U. S. Fire Extinguishers. Tremendous demand. Orders repeat. Exclusive territory to County and Dist. Mgrs. United Mfg. Co., 1043 Jefferson, Toledo, O.

AGENTS, 500% Profit, Free Sample Gold and Silver Sign Letters for store fronts and office windows. Any one can put on. Big demand everywhere. Write today for liberal offer to agents. Metallic Letter Co., 438 N. Clark St., Chicago, U.S.A.

BUSINESS OPPORTUNITIES

SMALL MECHANICAL DEVICE FOR BINDING sheaves or the like. Used by thousands. Large profits. Can be manufactured very cheaply by specially designed automatic machine, which we will sell with patent rights. For further particulars address J. Weinbrenner & Co., 10 Milk Street, Boston, Mass.

CONTRACTORS, BUILDERS, ATTENTION!

EFFICIENT LABOR-SAVING and useful earth-dumper or shovel for excavating, fully described in letters patent 1,087,343. Rare opportunity to buy on attractive terms. For particular write Patentee, G. R. Abbott, 1213 Fidelity Bldg., Baltimore, Md.

FOR SALE

CYCLECAR MOTORS, TRANSMISSION, Steering Gears, Hubs, Rims, Spokes, Tires, Parts. Catalogue free. For further particulars address Palmer Bros., Cos Cob, Conn.

HELP WANTED

BE A DETECTIVE. Earn \$150 to \$300 monthly. Easy work; we show you; open to all; experience unnecessary. Full particulars mailed. Write Wagner, 1243 Lexington Avenue, New York, Dept. 448.

INSTRUCTION

LEARN TO WRITE ADVERTISEMENTS.—Earn \$25 to \$100 weekly. We can positively show you by mail how to increase your salary. Prospectus free. Page-Davis Co., Dept. 89, Chicago, Ill.

PATENTS FOR SALE

Patent No. 1,010,309, unsinkable rubber boat. Lighter, faster, and yields to shock on account of elasticity of materials used. Great carrying capacity. Joseph Lupiano, 1 So. Main St., Asbury Park, N. J.

SCIENTIFIC APPARATUS

GLASS APPARATUS, thermometers for scientific and industrial laboratories, surgical glassware, experimental work. For further particulars address Laboratory Supply Co., 128 State St., Rochester, N. Y.

INQUIRIES

Inquiry No. 9367. Wanted the name and address of a manufacturer of an automatic centering machine.

Inquiry No. 9368. Wanted, the name and address of glass-bottle manufacturers or glass blowers who can manufacture a glass bottle and perforate it with some 12 small holes, in large quantities for export, to sell at a popular price.

Inquiry No. 9369. Wanted, the names and addresses of users of Indian Steatite (Soapstone), Cornundum and other Indian minerals, in quantities.

Inquiry No. 3970. Wanted the names and addresses of manufacturers of small wooden articles, particularly in such soft woods as pine and fir, for articles such as toys, furniture, etc.

Inquiry No. 9371. Information wanted where one could buy or have made to order machine to be used for making solid back brushes.

DO YOU KNOW WHAT'S DOING IN YOUR OWN BUSINESS?

EXCLUSIVE INFORMATION FOR MANUFACTURERS!

The Letters Patent Insurance Co. Ltd. is prepared to supply regularly to manufacturers, patentees or other interested parties, exclusive information concerning the latest patents and developments in any particular branch of commerce or industry, especially valuable to manufacturers outside the British Isles.

The Company's Board of Experts and Examiners, consisting of 69 of the world's most eminent scientists, is also prepared to make a report as to the novelty, utility and commercial possibilities of any patent or secret process. Report and Examination fees are charged on a very moderate scale.

Write for particulars to:

THE LETTERS PATENT INSURANCE CO., LIMITED
King's House, Kingsway, London, England

Curiosities of Science and Invention

Wrecked by a shifting foundation.

Theater building in course of erection in Victoria, Vancouver Island, had its foundation laid in blue clay. This proved to be a pocket in "made" land, and it shifted one night under the weight of the heavy brick walls. The displacement was only one foot, but this was sufficient to ruin the entire structure.

Motorcycle chemical fire-engine.

There has recently been developed in Oklahoma City a novel emergency fire-engine, consisting of a regular motorcycle equipped with two chemical tanks on either side of the rear wheel directly back of the driver's seat. This equipment can be brought into action more quickly than an automobile fire-engine.

2.

Chinatown's telephone exchange.

The most remarkable feature of the Chinese telephone exchange, located in the heart of San Francisco's Chinatown, is the fact that the Chinese girl operators know not only every number, but the corresponding name of every one of the 1,500 Chinese subscribers. The Chinatown branch has a Chinese manager, Mr. Leo Kum Shu.

Front drive tricycle motor car.

The idea of using a front drive in motor cars dates back to the very earliest days of the automobile, when efforts were made to use the motor in front of the vehicle as a substitute for a horse. Now, apparently the idea is being revived, as may be noted in the recent photograph.

4.

Courtesy of the Bureau of Surveys, Philadelphia

Uniform distribution of sewage in a filter.

Ordinarily in a filter bed using fixed nozzles, most of the sewage is distributed in a ring around each nozzle. In the Pennypack Creek Disposal Works, Philadelphia, the flow of sewage is rhythmically retarded and accelerated by automatic operation of a butterfly valve, so that the bed is uniformly dosed.

5.

Slot machine for the job seeker.

A Los Angeles inventor has installed a "job seeker's" slot machine on the streets. The glass case shows cards stating conditions offered by employers. Dropping a quarter in a slot releases the corresponding card, which bears the employer's address on the back. If he finds the job taken, the quarter is refunded by the firm operating the machine.

6.

ODDS AND ENDS FROM THE EDITOR'S DRAWER.