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ELECTRIC FIRING: HANG-FIRES AND MISS-FIRES.

Abstract of a Paper by William Maurice in The Quarry.

In view of the fact that recently there has been so many accidents reported as due to the "hang-fire" of explosives that it might not be out of place to point out that electric detonators can, and do at times, hang fire.

It is not unusual for one in a group of simultaneously fired shots to miss, and consequently there is always an element of danger in group-firing. Probably a nearer approximation to perfect safety would lie in the use of electrically ignited time fuses, though it must also be admitted that the use of a suitable detonator would go a long way towards insuring the simultaneous ignition of any number of shots. Hang-fire, or retarded ignition, may occur in the electric detonator, or it may occur in the explosive. A damp detonator might readily hang fire.

It is well known that a shot will sometimes explode some time after the coming to rest of the exploder-handle, whereas in general less than half a turn will suffice. The retardation might be caused by increased resistance in the circuit through broken wires, bad joints, or grease or dirt on spring contacts and terminals permitting the passage of only just sufficient electrical energy to warm the fuse bridge. The latter has then to be kept heated during several seconds before the temperature rises to the point of ignition of the priming. The same effect would be produced if the exploder were under-powered, owing. for instance, to loss of magnetism. Or delayed ignition might be caused by defects in the fuse, such as badly mixed, damp, or insufficient priming, or by a wet charge.

Captain Desborough states that he had electrical hang-fires when firing experimental shots with three different ammonium-nitrate explosives, that of greatest duration involving an interval of about 50 seconds between the explosion of the detonator and the explosion of the charge. With all these explosives he subsequently had several miss-fires, and in each case, when the charge was extracted, he found that the detonator had fired, but had failed to explode the charge. The difficulty was overcome when a stronger detonator was employed. In this connection Captain Desborough mentioned that a cartridge of carbonite was found to be burning in a shot-hole in a colliery in South Wales. This was by no means the first instance of the kind, and the cause seemed to lie in the use of a faulty or insufficiently powerful detonator.

The British "Annual Report of Inspectors of Explosives for 1906" also records three cases in which a "hang-fire" has occurred with electric firing. In one of these cases two attempts were made to fire a shot electrically (high tension). The cable was then disconnected from the detonator-leads and tested. It was found to be all right. The shot then exploded. There is practically no doubt, according to the report, that this was a case of hang-fire. The time elapsing between the disconnection of the cable and the explosion of the charge was about five minutes.

Dynamite, gun-cotton, nitrate of ammonia, and other blasting materials containing nitrates decompose gradually in the air and give out nitric oxide, but if they are ignited in a closed space they instantly decompose without forming a trace of nitric oxide. The first slow process changes immediately into the second if the free evolution of gas be hindered and the pressure raised. The reaction produced by a detonator is the same as that by ignition in a closed space at high pressure. Both are so rapid that the whole of the charge is at once converted into gas. But if the ignition be defective the charge may ignite and burn, instead of exploding; it is then said to "cook," and gives off nitric oxide. The explosive power of a charge also varies with its composition, and depends, in grisounite, upon the small quantity of nitro-napthalene that it contains. If the charge begins to burn, the increasing pressure caused by the gases given off may produce an explosing, and ignite the cartridges one after the other.

BOOK REVIEWS.

Books reviewed in these columns may be secured from Vannevar & Company, 438 Yonge Street, Toronto, Ont.

Hydraulic Calculator. — By R. O. Wynne-Roberts, M.I.C.E. Published by the St. Bride's Press, Limited, 24 Bride's Lane, Fleet Street, London, E.C. Price, $1.50.

This is a pocket hydraulic calculator, prepared to expedite the work of the hydraulic engineer. The simplicity of the operation to ascertain the necessary information respecting dimensions, gradients, velocities and discharges of any circular pipe is one which will doubtless appeal to the practical engineer occupied in the design of a variety of hydraulic or sewerage works which necessitate intricate and tedious mathematical calculations. This Pocket Hydraulic Calculator is applicable for circular pipes ranging from 3 to 40 inches, with gradients of from 1 in 1 to 1 in 10,000. It has, of course, been impracticable to insert any figures except the leading ones, but the others can be easily interpolated with a sufficient degree of accuracy. It will solve any of the following problems: Given—(1) Velocity and gallons. (2) Velocity and diameter. (3) Velocity and inclination. (4) Gallons and diameter. (5) Gallons and inclination. (6) Diameter and inclination. To find—Diameter and inclination, gallons and inclination, gallons and diameter, inclination and velocity, diameter and velocity, gallons and velocity.

Electrical Railroading or Electricity as Applied to Railroad Transportation.—By Sidney Alymer-Small. Handbook size bound in leather; 924 pages, 539 illustrated. Frederick J. Drake & Company, Chicago, publisher. Price,——

This book is primarily written for railroad men, but will also prove interesting to those who desire knowledge of the application of electricity and transportation by rail. It has, however, been written more as a help to the railroad man to permit him by a little study to become familiar with the underlying principles of electric traction and the operation of such systems. It is not written in the usual way, but is gotten up as a series of lessons or cathechisms, the style of which is questions and answers, placed alternatively. The author has endeavored to explain in a simple and practical manner the principles of electricity and magnetism and the adaption of electrical power and railroading. The first five lessons take up Static electricity condensers and Static electrical machines. Lessons 6 to 9 deal with lightning phonomena, explanation of, and method of protection. Lessons 10 to 15 explain the elementary principles of magnetism, magnetic induction, electro magnets and the law of magnetic circuits. Primary cells and storage batteries also receive attention. The theory of electric circuits, dynamos and motors is taken up in order and discussed with attached catechisms. Several lessons cover the description of modern substations, power houses and switchboards. The remaining 450 pages cover a detailed description of the principal systems used in electric traction. This part is very well illustrated with cuts of machines and apparatus, transmission, comparative data between steam and electric traction, advantages and disadvantages of AC and DC motors and equipment; rolling stock and a detailed description of the Westinghouse AC system. The Sprague and Westinghouse control are discussed. The book ends up with catechisms on suburban motor and air-brakes. The book will prove useful and of value to the railroad man, and those who desire to gain knowledge of the principles, electric traction and operation of electric roads. F. A. G.