The Blasters' Rheostat

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Once electric blasting caps became generally accepted by the mining and quarrying industries, there arose a need to ensure that these electric caps would detonate when electric current was applied. In the early days of electric blasting there were few reliable methods for detonating these caps. After their development in the late 1800's, rack bar (push down or pull up) or twist blasting machines became the industry standard for activating electric blasting caps.

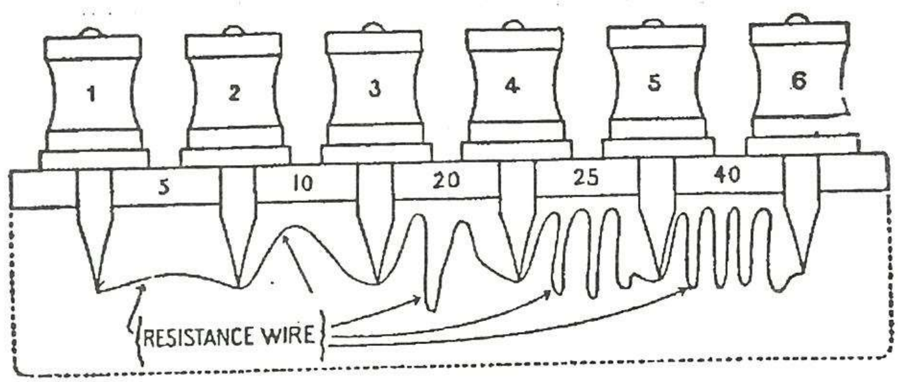

Fig. 1

It was the need for a safe and economical way of testing the various blasting machines that precipitated the development of the blasters' rheostat. The early blasting machines were of the magneto type which relied on a permanent magnet to help develop the charge, and were susceptible to loss of magnetism, so that over time their efficiency decreased. As the efficiency of these blasting machines began to decrease, there were more and more misfires. These unexploded explosive charges were deadly to the miners and quarrymen who had to load the broken rock into cars for haulage to the processing plants.

How then could one safely and economically test a blasting machine? Say one had a planned blast of 50 caps and wanted to make sure the blasting machine (rated for 50 caps) could fire all 50 charges. The sure way would be to wire up 50 caps with the appropriate lengths of wire and fire them. If all detonated, then one could assume that the blasting machine was working up to capacity. This method was time consuming and costly in the number of electric caps expended.

Thanks to the efforts of scientists in Europe and the United States there emerged a practical application of Ohms Law to the art of electric blasting. The result was the blasters' rheostat, a simple but highly accurate measuring device.

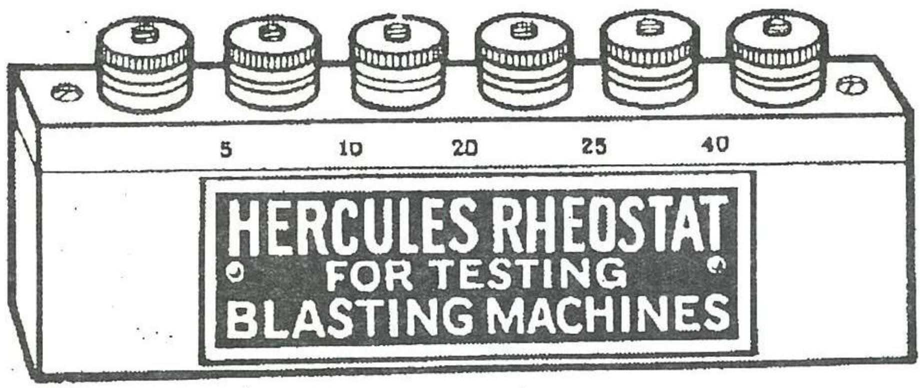

Fig 2

What is a rheostat? To fully understand what the rheostat does, one needs an introduction to Ohms Law. Simply stated Ohm says that the current supplied (in amperes) to any electrical circuit will be equal to the potential (in volts) of the power supply divided by the resistance (in ohms) of the circuit. What this means is that the type (copper, iron, etc.), diameter and length of the wire used in making

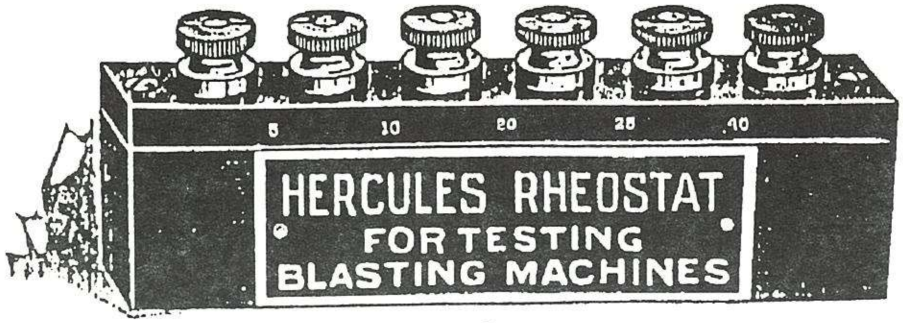

Fig. 3

the blasting circuit will determine how much power is needed to fire all the charges.

Blasters' rheostats are small devices usually made of either wood or plastic, having an internal configuration similar to figure #1. This diagram shows a very simple device having wires of known length, diameter, and composition arranged so that various resistance combinations can be achieved depending on how the unit is wired. It appears that all early blasters' rheostats were either manufactured by the same company, or were made to a certain specification that was adopted by the major powder companies. Refer to figures #2 through #5 for examples of these devices.

How then does one use the rheostat to test a blasting machine? Suppose that a blast is to be fired requiring 30 electric blasting (EB) caps. The problem is how to test the 30 EB-cap-rated blasting machine to ensure that all 30 bore holes will be initiated. The test would be conducted as follows:

[Editors Note: don't try this at home. Blasting caps, like all other explosives, should be handled only by professionals].

1. Connect one wire from the EB cap to the post on the rheostat marked with a 10 (second post).
2. Connect one of the blasting machine lead wires to the post marked 20 (third post).
3. Connect the remaining EB cap wire to the other leading wire from the blasting machine, thereby completing the circuit. Ensure that there is enough wire for the EB cap to be buried far enough from the test operator and at least 8 inches below ground or in sand before detonating.
4. Raise the rack bar handle and push down with a sharp thrust. This should have initiated the EB cap, demonstrating that there was resistance equal to 30 electric blasting caps, which proved that the machine was working up to its rating of 30 EB caps.

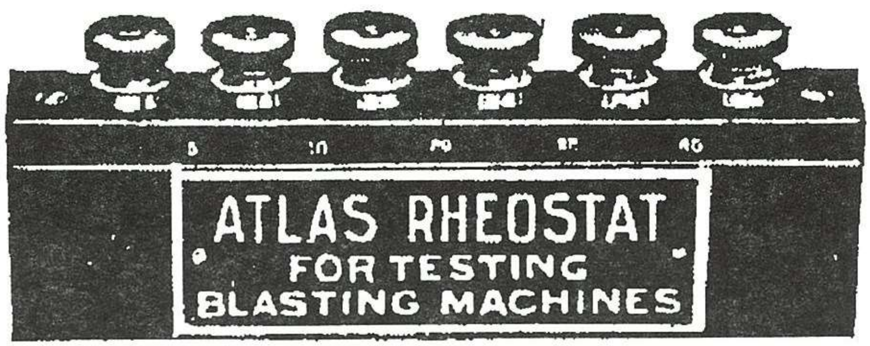

Fig. 4

Most of the rheostats made were based on EB caps having 30 foot copper wires, and in addition had a safety factor built in to take care of the added length of leading and connecting wires.

In the late 1920's Atlas Powder Company began to experiment with an improved rheostat. By 1928 they were successful in designing a new rheostat known as the Atlas Duplex Rheostat (figure 6). This device had two extra posts which would allow one to hook up the EB cap to the last two posts and then select the resistance desired from the remaining posts, and hook up the blasting machine to these. This simplified the wiring for the test process.

DuPont Corporation, through its Explosives Division, improved their rheostats in the mid-sixties by employing the same type of locking posts and plastic case as the Atlas Duplex unit, but did not add the two extra posts.

It appears that the blasters' rheostat has fallen out of favor with most blasting operations today. One major reason is that the new capacitor discharge system blasting machines used today produce electric currents sufficiently high to burn out the wires in a rheostat.

This is by no means a complete listing of rheostats, but is intended to provide general knowledge of what a blasters' rheostat was and how it was used. If anyone has information on rheostats bearing the names of other powder companies, I would appreciate hearing from them.

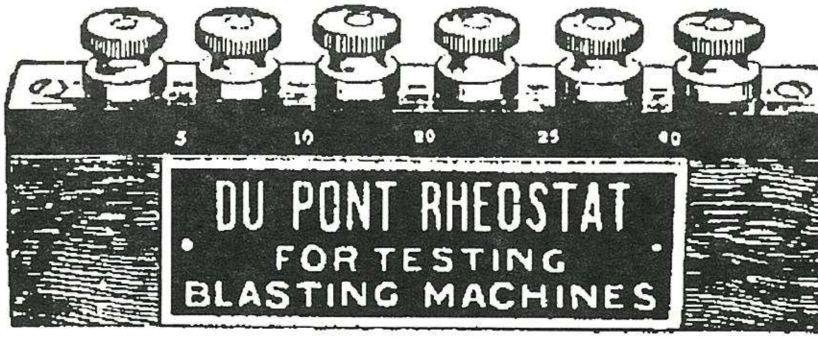

Fig. 5

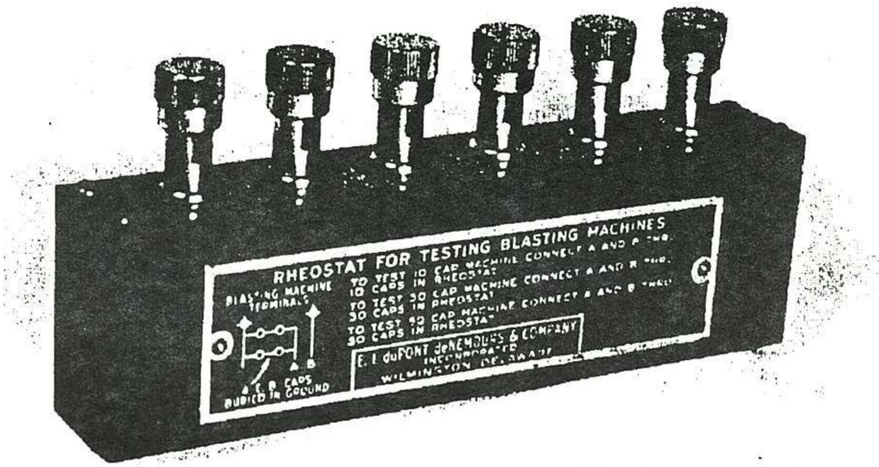

Fig. 6

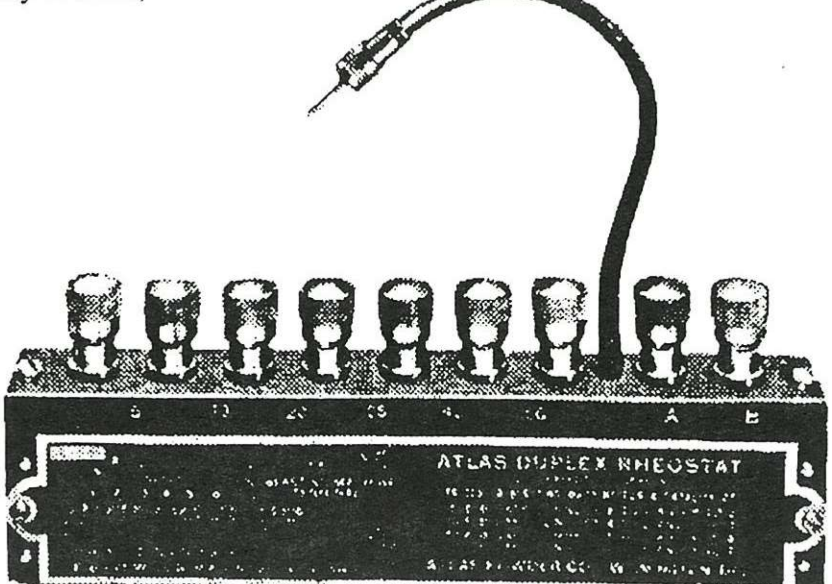

Fig. 7

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