

Mining Ventilation 2010



Centennial Coal

Saving Money on Ventilation

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Brisbane

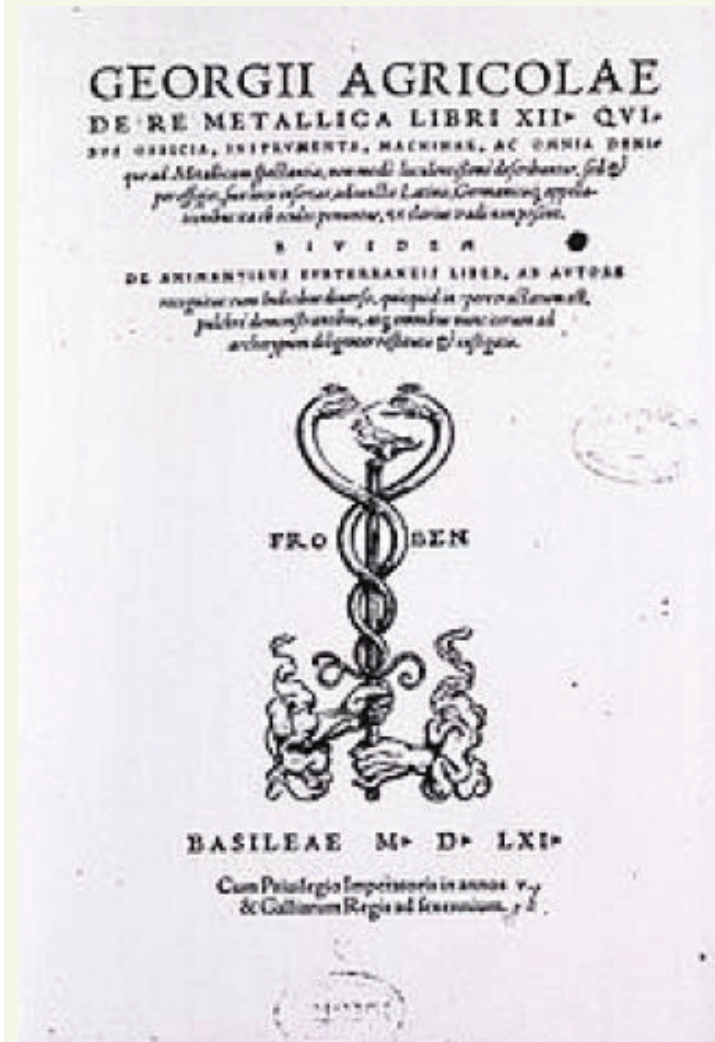
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FUTURE POWER



Centennial Coal

Latin Ventilation



De re metallica (Latin for *On the Nature of Metals (Minerals)*) published in 1556, by Georgius Agricola (Georg Bauer).

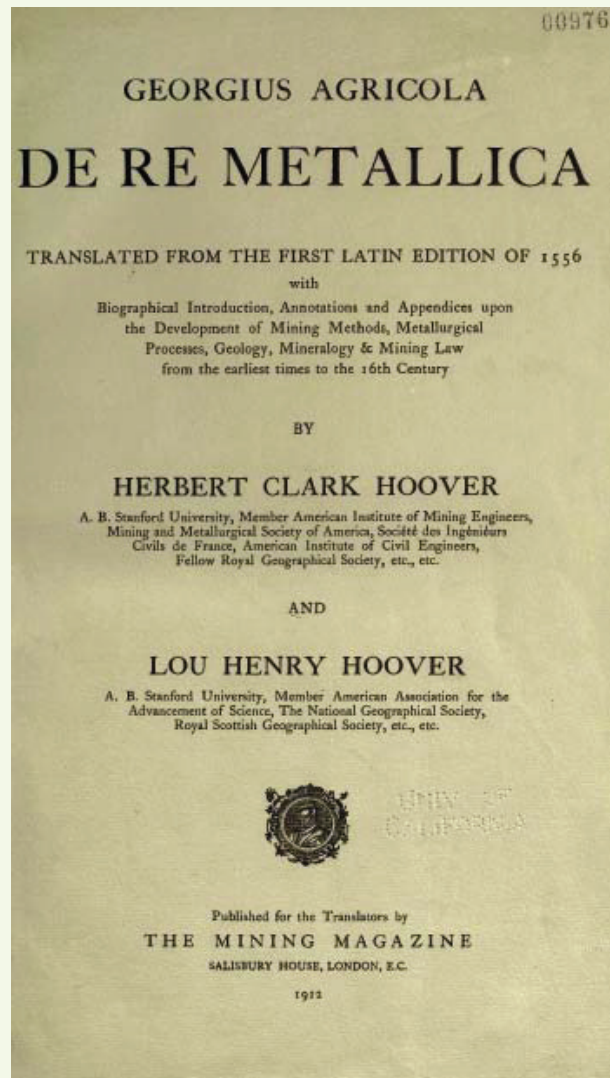
Agricola explains that mining and prospecting are not just a matter of luck and hard work; there is specialized knowledge that must be learned.

Of 12 books, 2 are explored here:

Book I: *Arguments for and against this art*

In Book VI: *The miners' tools and machines*

Latin Ventilation Translated



De re metallica, remained the authoritative text on mining for 180 years after its publication

The first English translation of *De re metallica*, by Herbert Hoover (1912)

Herbert Hoover was a mine engineer, his wife (Lou Henry) a geologist and Latinist

Naturalis Historia, by Pliny the elder

Why Ventilate?

Effective ventilation is a timeless issue

‘In such a case (poor ventilation) it weighs heavily on the miners, causing them to breathe with difficulty, and sometimes they are even suffocated, and burning lamps are also extinguished’, Agricola.

Georgius Agricola, 1556 *De Re Metallica*, (translated from the first Latin edition of 1556 by Herbert Clark Hoover and Lou Henry Hoover), pp200 - 212 (The Mining Magazine Salisbury House, London, E.G. 1912)



Ventilation Machines

Genre of ventilation machines:

- Wind Diverters
- Fans
- Bellows

Georgius Agricola, 1556 *De Re Metallica*, (translated from the first Latin edition of 1556 by Herbert Clark Hoover and Lou Henry Hoover), pp200 - 212 (The Mining Magazine Salisbury House, London, E.G. 1912).



A—TUNNEL. B—PIPE. C—NOZZLE OF DOUBLE BELLOW.



A—WOODEN BARRELS. B—HOOPS. C—BLOW-HOLES. D—PIPE.
E—TABLE. F—AXLE. G—OPENING IN THE BOTTOM OF THE BARREL.
H—WING.



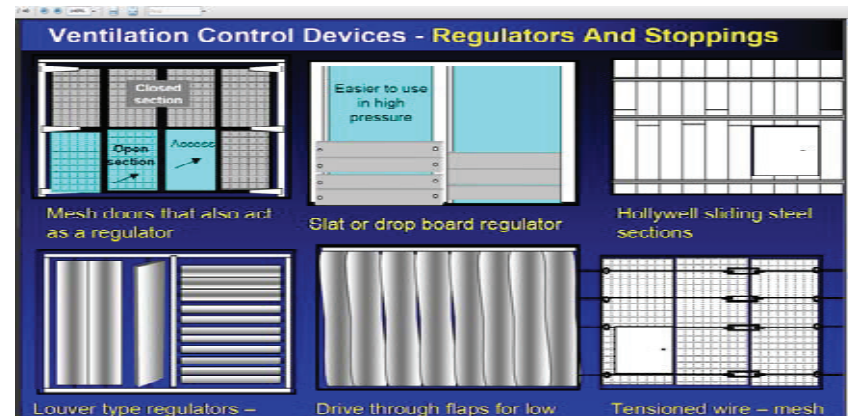
A—MACHINE FIRST DESCRIBED. B—THIS WORKMAN, TREADING WITH HIS FEET, IS COMPRESSING THE BELLOW. C—BELLOW WITHOUT NOZZLES. D—HOLE BY WHICH HEAVY VAPOURS OR BLASTS ARE BLOWN OUT. E—CONDUIT. F—TUNNEL. G—SECOND MACHINE DESCRIBED. H—WOODEN WHEEL. I—ITS STEPS. K—BAR. L—HOLE IN SAME WHEEL. M—POLE. N—THIRD MACHINE DESCRIBED. O—UPRIGHT AXLE. P—ITS TOOTHED DRUM. Q—HORIZONTAL AXLE. R—ITS DRUM WHICH IS MADE OF HUNGLES.

Modern Ventilation

- Predevelopment gas drainage
- Modern ventilation uses fans and power
- Mine design
- Ventilation design LOM

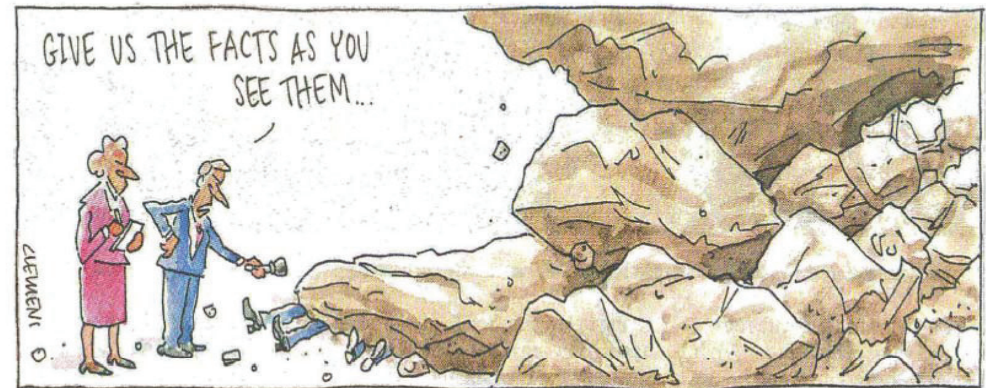
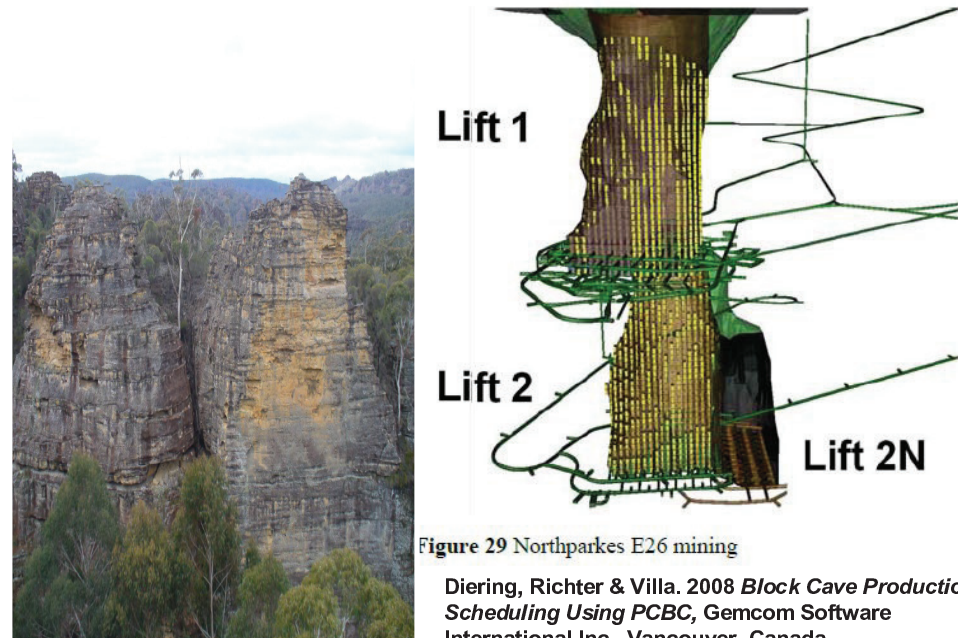


BroKrew Industrial (Pty) Ltd, Krugersdorp RSA



Mine Design

- Maximise resource recovery
- Mitigate groundwater inflow
- Locate drives/ shafts to maximise natural geothermal ventilation
- Stoppings and brattice to maximize ventilation
- Risk assessment
- Management and Monitoring
- Proactive Trigger Action Response Plans (TARP)



New Technology

Improvements in mine technology

- Strata control
- Communication
- Transport
- Fans
- Pumping
- Ore handling
- Processing
- Monitoring

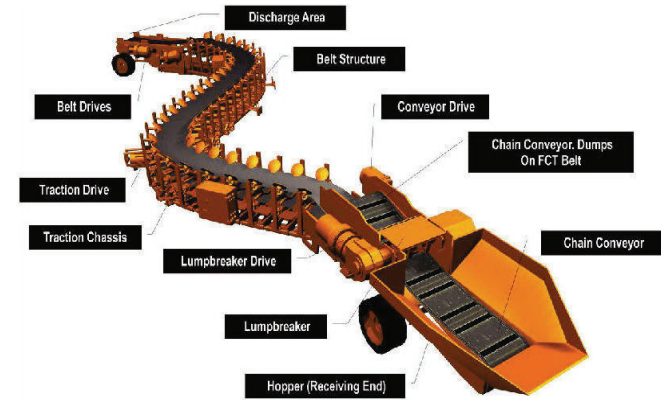


Figure 4 - Flexible Conveyor Train

Old Technology

- Simple machines
- Seasonal changes
- Flames to indicate gas
- Number shafts and drives
- Size of apertures

Georgius Agricola, 1556 *De Re Metallica*, (translated from the first Latin edition of 1556 by Herbert Clark Hoover and Lou Henry Hoover), pp121-122 (The Mining Magazine Salisbury House, London, E.G. 1912)



A—PROJECTING MOUTH OF CONDUIT. B—PLANKS FIXED TO THE MOUTH OF THE CONDUIT, WHICH DOES NOT PROJECT.



A—SILLS. B—POINTED STAKES. C—CROSS-BEAMS. D—UPRIGHT PLANKS. E—HOLLOW. F—WINDS. G—COVERING DISC. H—SHAFTS. I—MACHINE WITHOUT A COVERING.

Using Nature

Using Nature - Creighton 9-shaft workings

Using an ice cavern as a cooling system

Vale Inco's Creighton mine: Digging deeper by the day in Viewpoint: perspectives on modern mining, a publication of Caterpillar Global Mining / 2008: issue4 © 2008 Caterpillar Inc. found at ww.cat.com.



Using Nature

Could we just leave it
all to Nature?

Nature can assist
ventilation

Huntly West Coal
Mine, in NZ

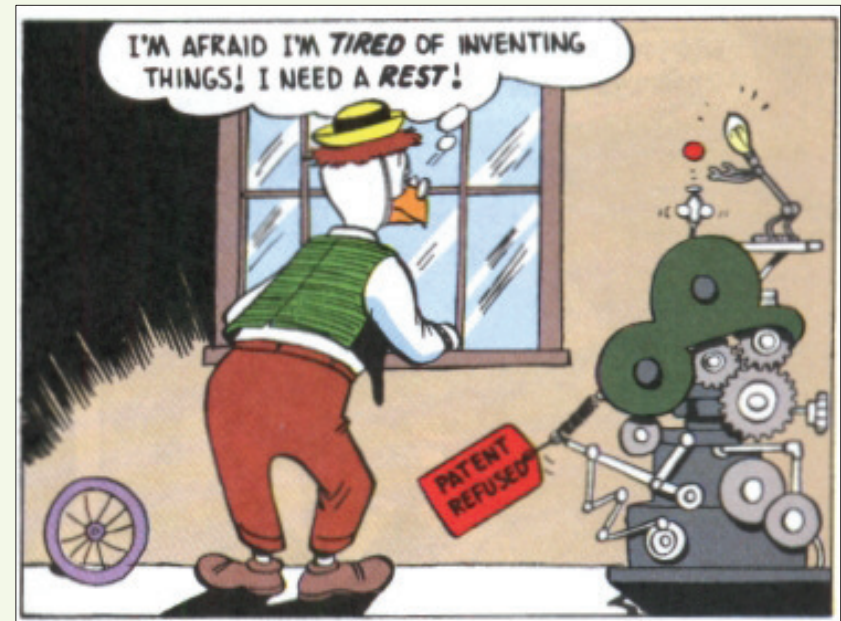


4 x-cut East Return, intersection to east of Vent Shaft
(half full of water)

Too Much Technology ?

BHP Copper's San Manuel Mine

- Intake fans
- Low pressure booster fans
- Fans mounted on vent raises
- Compressed air movers
- Blowing ventilation devices
- Refrigeration units
- Blowing systems with vent tube
- Forced air ventilation system



Mine Ventilation System at BHP Copper San Manuel Division Underground Sulfide Operation First Edition March, 1997 Magma Copper Company San Manuel, Arizona 85631. Revised by G. Lopez & D. Pelletier Contributors, Dr. K. Mutama T. Casten

Too Much Technology

Too much?

- Complex
- Lots of horse power
- Recirculation
- Great cost



Is there another way?

Over Ventilation

- Many mines waste power
- There are ways to avoid over ventilation
- Identifying areas for power savings based on previous expenses and bills
- Selecting downtime
- Adapting telemetry technology
- Other techniques
- Why ventilate?



Figure 2 Tele-Remote Operator Station

Swadling & Dudley 2004 *VRLoader – a Virtual Reality Training System for a Mining Application* Northparkes Mines

A Balance: Some Technology

- Management and monitoring
- Solution - never be to just turn up the fans and pump more air in.
- An effective Ventilation Management Plan
- Air and ventilation performance to the face
- Pressure and resistance tends to drive a ventilation circuit
- How many regulators are in the mine, ideally one.
- Monitoring of gas
- Gas drainage can minimise ventilation needs
- Geothermal structure of the mine



Considerations and Contingencies

- Review of current management
- Formulation of Ventilation Management Plan
- Formulation of Explosive Hazard Management Plan
- Formulation of Dust Hazard Management Plan
- Formulation of Gas Hazard Management Plan
- Trigger Action Response Plans (TARP) Accepting and applying agreed processes.
- Measuring, monitoring and reviewing performance



Compliance, Communication & Consultation

- Mine Ventilation is closely and comprehensively regulated
- Effective communication, and consultation with the workforce
- Regular meetings with employees for implementation of ventilation systems
- Ongoing involvement of people from different shifts/ disciplines
- Good solutions
- Training in ventilation for all



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**Thank you.
Any Questions?**