**6 Keeping It Safe**
Learn the benefits of buying hose assemblies

**8 Profile of Courage**
Ernest Shackleton braved the unknown to discover new lands

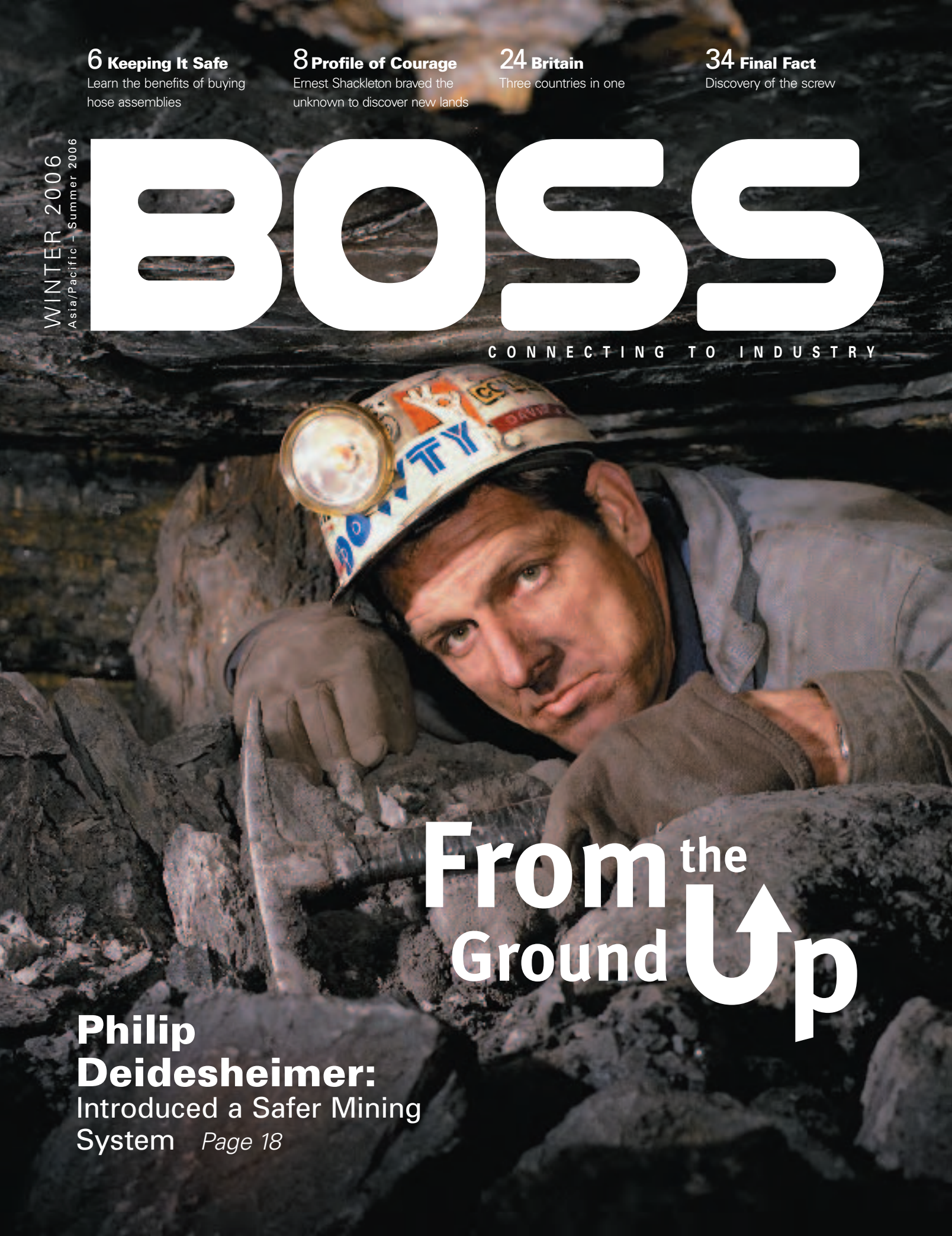
**24 Britain**
Three countries in one

**34 Final Fact**
Discovery of the screw


WINTER 2006
Asia/Pacific - Summer 2006

# BOSS

CONNECTING TO INDUSTRY



## From the Ground Up

**Philip Deidesheimer:**
Introduced a Safer Mining System *Page 18*

# *Dixon: For products and support that's broad and deep.*

When you choose Dixon, you get more than just products. You get:

- Uncompromising quality
- Solutions for a whole range of industries
- Immediate product availability
- Expertise about the right product for the right application
- Free in-house product testing capabilities
- Applications training programs
- On-site hose assembly safety programs
- A company that cares about its customers, and it shows

No one else makes a bigger commitment to your smooth-running operation and bottom-line profits. Ask for Dixon products by name. ***When it's got to be right, it's got to be Dixon.***

DIXON

*The Right Connection™*

**www.dixonvalve.com**

**Dixon Valve & Coupling Company**
800 High Street, Chestertown, MD 21620 USA
877-963-4966 • 410-778-2000 • Fax: 410-778-4702

BOSS
WINTER 2006
ASIA/PACIFIC – SUMMER 2006

## departments

6 **KEEPING IT SAFE**
Making Reliable Hose Assemblies Requires Knowledge

8 **PROFILE OF COURAGE**
Ernest Shackleton Braves New Frontiers

16 **FACTS & FIGURES**
Coal Mining Facts

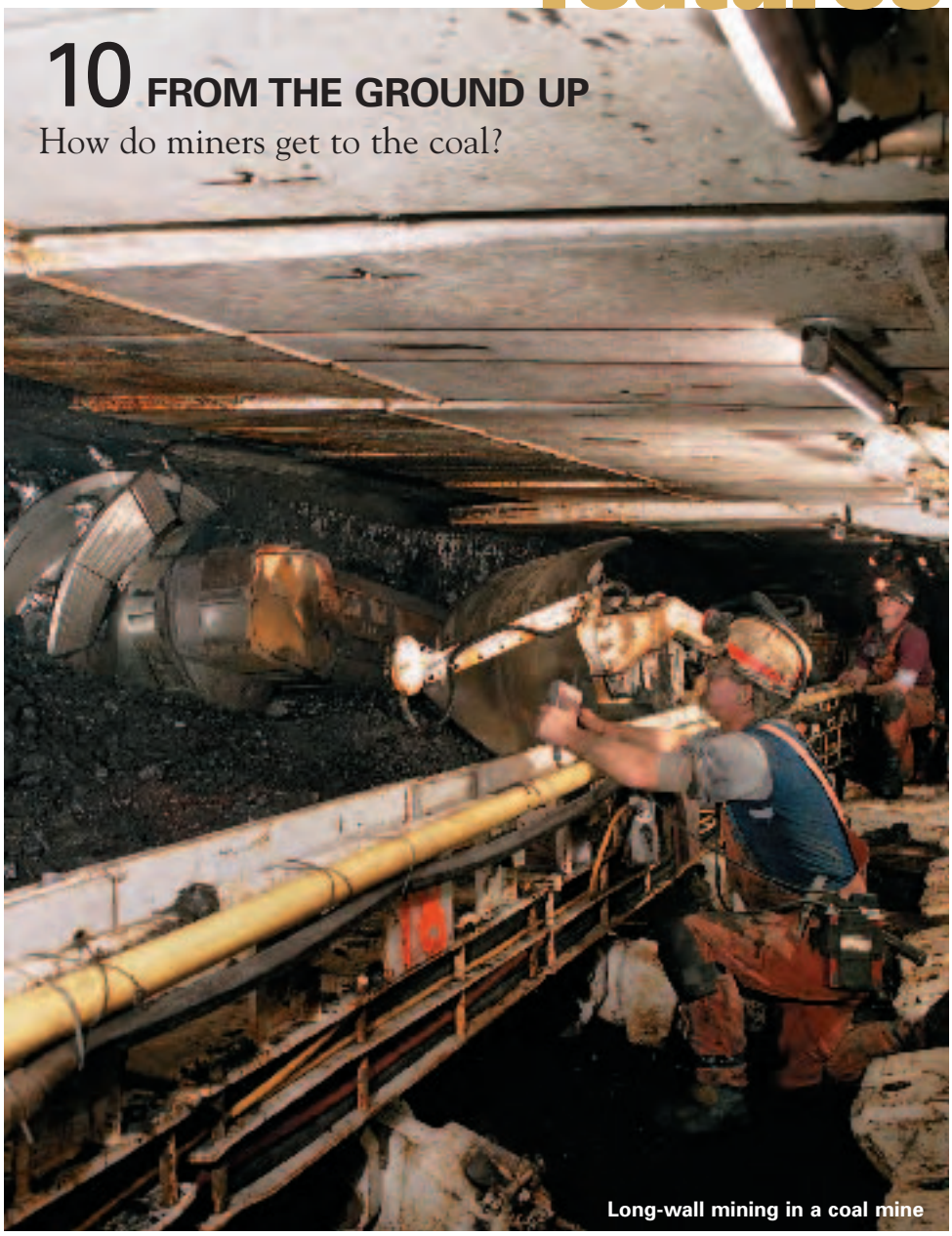
17 **BUILDING CHARACTER**
There's No Such Thing as Business Ethics

32 **HEALTH & FITNESS**
The Benefits of Vitamin A

34 **FINAL FACT**
The Turn of the Screw

## features

10 **FROM THE GROUND UP**
How do miners get to the coal?



Long-wall mining in a coal mine

18 **PHILIP DEIDESHEIMER**
He introduced a safer mining system.

24 **BRITAIN: THREE COUNTRIES IN ONE**
England, Scotland and Wales are filled with history and stunning landscapes.

# We Are Listening

"From the ground up." In this, our fourth issue of *BOSS* magazine, the phrase has to do with the history of coal mining operations and the role mining plays in our lives.

In a wider sense, however, the phrase also provides a formula for business. Start at ground level with the end-user, and build an organization with great people that meets that customer's needs. We, at Dixon, have always responded to our customers' needs. This past year, the world witnessed several natural disasters. In the United States, New Orleans was destroyed. As the rebuilding process began, Dixon added extra shifts to provide products as quickly as possible to the area.

The most effective way to satisfy customer needs is through open lines of communication. One of the ways we are communicating with our end-users is through *BOSS*. With each issue, we intend to highlight those industries that use Dixon products and to generate discussion. In the process, we hope we will get to know each other better.

Each year about this time, the leaders of the Dixon business units from around the world gather in Chestertown, Maryland, to refine plans for the upcoming year. It is always a pleasure to participate in these discussions and listen to the great ideas generated. We have a quality team, and I am proud to work with them. The foundation for their ideas, however, is the ability to know what the customers want and to focus our efforts on providing it. We learn about product improvement and customer service by listening to our customers and each other.

A final note, I speak for everyone in the Dixon family when I wish you and yours a prosperous 2006. We look forward to serving you because we are *The Right Connection*.

Thank you,

Dick Goodall

R.L. Goodall
CEO, Dixon Valve & Coupling Company


**BOSS**

**WINTER 2006**
**ASIA/PACIFIC – SUMMER 2006**

Publisher
**Dixon Valve and Coupling Company**

Editor
**Randi Hertzberg**

Editorial Board
**Joseph Dawson - Vice President Marketing and Business Development**
**Louis F. Farina - President, COO**
**Richard F. Flaherty - President Sales and Marketing Division**
**Richard L. Goodall - CEO**
**Douglas Goodall - Board of Directors**
**Bob Grace - Dixon Fire Division Manager**
**Karen R. Hurless - Advertising Manager**
**Scott Jones - National Sales Manager**
**Mark Vansant - Vice President of Customer Service**

Editorial & Design
**Alter Custom Publishing**

Art Director
**Jason Quick**

Directors of Alter Custom Publishing
**Colleen McKenna**
**Jonathan Oleisky**

Please submit address changes to:
**Alter Custom Publishing**
**Attn: Sarah Moran**
**1040 Park Avenue, Suite 200**
**Baltimore, MD 21201**
**443-451-0736**
**Fax: 443-451-0777**

*BOSS* is produced quarterly by Dixon Valve and Coupling Company and Alter Communications. The acceptance of advertising does not constitute endorsement by Dixon Valve and Coupling Company of the products or services. The publisher reserves the right to reject any advertisement that is not in keeping with the standing or policies of Dixon Valve and Coupling Company.



**Dixon Valve and Coupling Company**
**800 High Street**
**Chestertown, Maryland 21620**
**(877) 963-4966**
**Fax: (800) 283-4966**
**www.dixonvalve.com**


# The right connection for stainless sanitary fittings: All across the country.

## *…Just when you need them.*

Bradford sanitary stainless steel fittings and valves from Dixon meet your exact requirements for food processing and dairy applications. Custom design and fabrication services provide solutions to even your most challenging applications.

With 13 distribution centers all across the country, you'll be assured of quick delivery.

Not only that, you get the Dixon quality and service you've come to expect. ***When it's got to be right, it's got to be Dixon.***

DIXON

*The Right Connection™*

**www.dixonvalve.com**

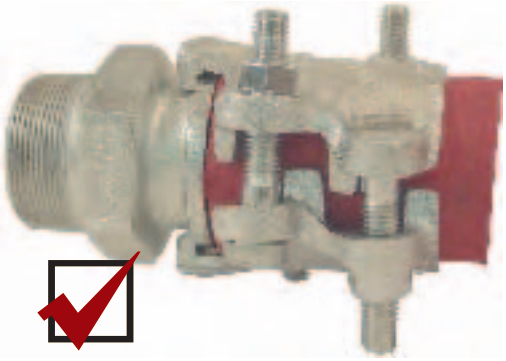
**Dixon Sanitary**
N25 W23040 Paul Road, Suite C
Pewaukee, WI 53072 USA
800-789-1781 Fax 800-789-4046

# Making Hose Assemblies Requires Knowledge and Experience

Life is full of choices. Each choice is a compromise. Do we take the expressway to save 10 minutes of drive time or do we take the scenic route with the great view of the lake and the countryside? Do you buy the green car that is loaded and at a great price, or the silver car with less equipment because you love the color? Do we make our own hose assemblies at the plant to save some time and money, or do we have a distributor, with their expertise, make them for us?

One plant made the choice to make their own hose assemblies. This plant was installing new storage tanks and loading stations. Traditionally, these were connected via hard piping. However, by choosing to use hose, they would save time as well as labor costs. Buying hose, couplings and clamps in bulk would also save money. This system would also give the plant the flexibility of having a new assem-

## DO AND DON'T

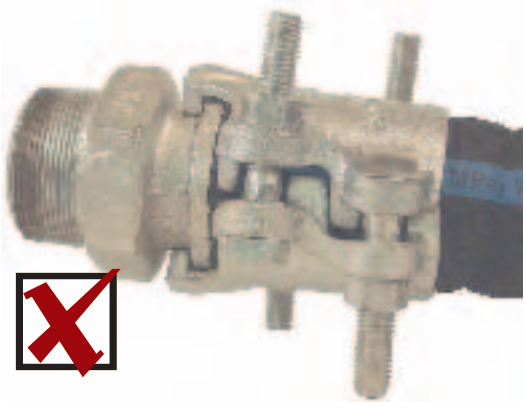


**Do:**

- Select the proper clamp based on inside and outside diameter of hose.
- Ensure even showing of hose between the clamp sections.
- Tighten bolts to recommended torque.
- Know that bolts are designed to bend.
- Know that clamps are designed to bend.
- Retorque bolts regularly.

**Don't:**

- Allow the individual body sections of the clamp to touch.
- Reuse bolts.
- Replace bolts with bolts of any other strength.
- Reuse clamps.



bly ready in a few minutes if needed, especially with their round-the-clock schedule. According to the plant manager, any worker who can hold a wrench and tighten a few bolts can be a certified pipe fitter.

Fast forward six months. Ten assemblies that the plant made to connect the storage tanks to the loading stations began leaking. The plant manager calls the distributor that he bought the hose and fittings from to complain about the inferior products they had sold them. He also wanted to know what they were going to do about fixing this situation and how quickly it would be repaired. The distributor salesman met with the plant manager and their safety engineer. A Dixon salesman also attended the meeting because the couplings and clamps were made by Dixon.

During the examination of the leaking assemblies, the Dixon salesman discovered that the bolts in each of the clamps were not tightened to the torque specified in the Dixon catalog. In fact, the bolts were less than half the recommended torque value. The question was asked, "When was the last time someone here at the plant retightened the clamp bolts?" The plant manager replied that his highly trained and qualified staff never had to retighten anything once it was installed. At this point, the Dixon salesman explained "cold flow," a process of bolt tightening sequence, clamp selection, hose measurement and other items that ensure the proper selecting, installing and maintaining of an industrial hose assembly. After listening to the cold flow explanation, the safety engineer asked the distributor salesman why he was not informed of all of this when these products were purchased. The distributor salesman replied: "You told me that you had certified pipe fitters at your plant and that putting together a hose assembly would be child's play for them." The safety engineer began to realize that not knowing all the facts of making industrial hose assemblies could be far costlier than whatever money was saved by doing it themselves. He also learned to let the "experts" at the distributor do what they do best; make industrial hose assemblies.

Choices. We all have to make them. Make yours with "The Right Connection." If you choose to make your own hose assemblies, be sure to follow the assembly recommendations of the hose and fitting manufacturers.

# Ernest Shackleton's Heroic Rescue

By Paul Ward

*"MEN WANTED: FOR HAZARDOUS JOURNEY. SMALL WAGES, BITTER COLD, LONG MONTHS OF COMPLETE DARKNESS, CONSTANT DANGER, SAFE RETURN DOUBTFUL. HONOUR AND RECOGNITION IN CASE OF SUCCESS."*

*- SIR ERNEST SHACKLETON*

So runs the fictional advertisement for what became Ernest Shackleton's Imperial Trans-Antarctica expedition of 1914 - 1917. The intentional goal was ambitious—audacious, to cross the Antarctic continent from coast to coast via the South Pole. Only 10 men had ever stood at the South Pole at that time, and five of those had died on the return journey.

Shackleton (the "boss" to his men) and a mixed crew of scientists, officers and sailors left South Georgia Island on December 5, 1914. They entered the Antarctic pack ice in the notoriously ice-scoured Weddell Sea on December 7, 1914 aboard the strengthened 300-ton steam- and sail-powered ship *Endurance*. There were 28 men, seasoned Antarctic veterans, experienced sea-farers, some simply the only man available to fill a particular post—one was a stowaway! Shackleton knew that it was a particularly bad ice year, but he was surprised to hit the pack ice two days after they started the journey. Five weeks later, the *Endurance* was stuck—frozen in the ice hundreds of miles from land for the long, dark Antarctic winter. The ice played with the *Endurance* until some nine months later. It crushed the ship to matchwood. Shackleton's reaction was calm. In his soft Irish tones, he informed the men, "Now we go home."

With the ship gone and the crew's situation unknown to a world before telecommunications, rescue was not going to come to them. The *Endurance* crew had to save themselves. For Shackleton, failure was not an option. Along with Frank Wild, second in command, he formulated a plan of action to escape the grip of the Antarctic ice and bring the men to safety. Conditions were against them, and plans had to be changed several times. Sometimes they had to stay put, as movement over broken and layered ice was so difficult and slow as to be ineffective; the ice was drifting anyhow and taking them in the right direction.

Eventually, the day (April 9, 1916) came when the ice had broken sufficiently to launch the three lifeboats the crew had salvaged from the *Endurance*. This was an irreversible decision as once the boats were in the water, going back to drifting ice was not possible. So followed the worst part of the adventure for many of the crew, awash in freezing seas and unable to lay down to sleep in soaked clothing. Frostbites were common, sea-water boils affected almost all of them. Shackleton, Wild and another unsung hero, Tom Crean, led by example, staying at the tiller for upwards of 30 hours at a stretch.

Despite difficulties, the crew reached Elephant Island on April 12, 1916. This was a temporary respite as the next winter was approaching and help had to be summoned. Another boat journey was necessary, across 800 miles of the wildest seas in the world to reach South Georgia Island and its whaling stations. Shackleton chose five men to accompany him for this journey, some were the best to take, and others were selected so as not to ferment discontent on

**(left) The *Endurance* reached the head of the Weddell Sea, but impenetrable barriers of ice prevented further progress. (above) For two days and nights every effort was made to cut the ship free, but the temperature continued to fall. (right) Snow dogs watched the icepacks of the Weddell Sea crush the sinking Endurance on November 1, 1915. (bottom) The crew continues the journey from Elephant Island.**

Elephant Island. The *James Caird*, the most sea-worthy lifeboat, was improved and readied for the journey. Two weeks later, the *James Caird* was at sea again.

This boat journey is widely regarded as one of the most arduous ever. Against incredible odds, this group landed on South Georgia two weeks later. Two of the men were almost spent and were virtual invalids. They were now on the wrong side of South Georgia, however. They could have set off by sea, 130 miles, but this was thought too difficult and dangerous. Ten days after arrival, three men, Shackleton, Crean and Frank Worsley, set off on foot wearing improvised crampons—brass screws stuck into their boots—along with a short length of rope and a carpenter's adze (pick), but no tent or sleeping bags. No one had ever crossed South Georgia before.

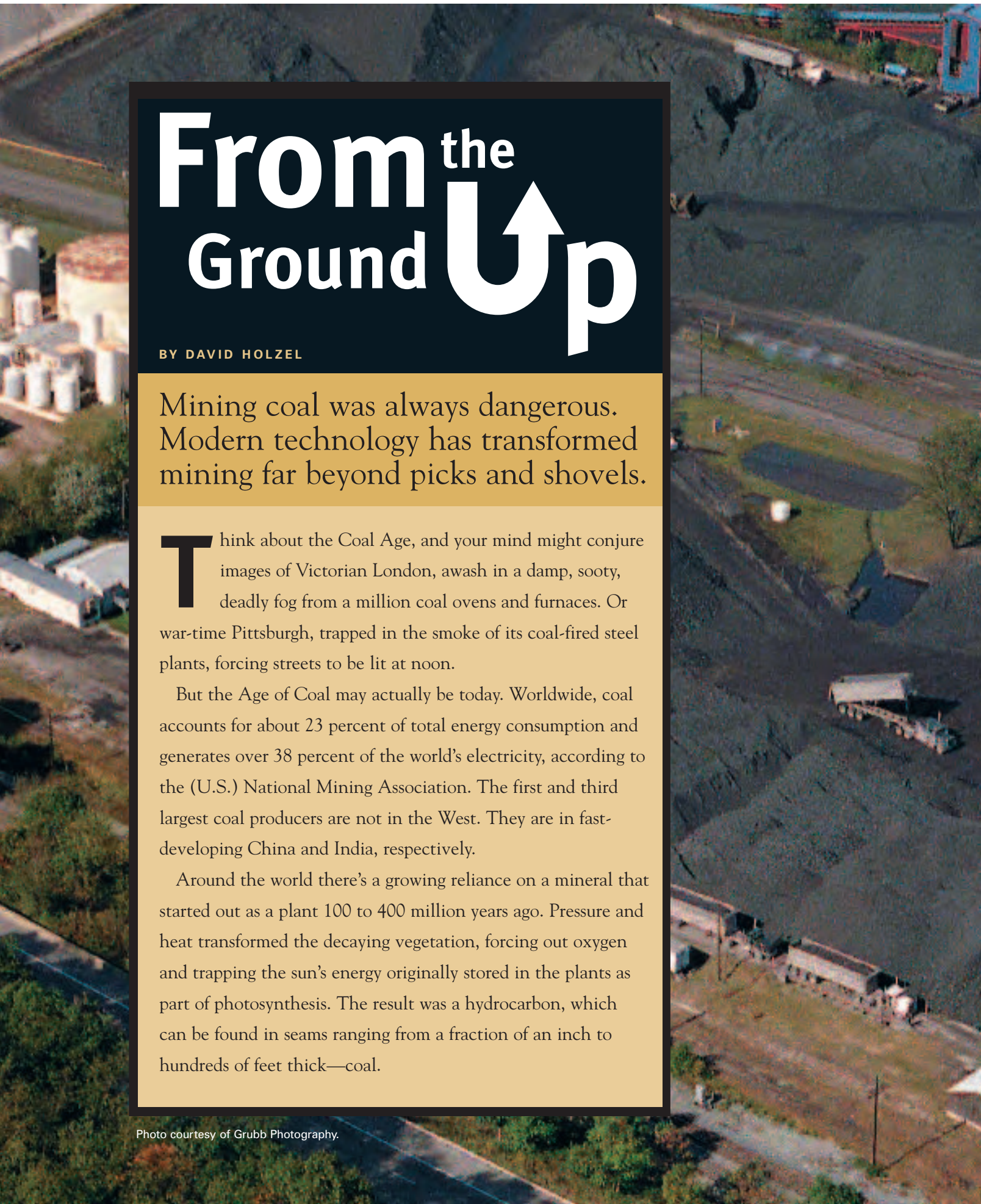
Another extraordinary journey followed as Shackleton and his two companions, fighting fatigue and terrain, reached Stromness whaling station on May 20, 1916. Almost immediately a rescue attempt was made, but the ship was turned back 60 miles away by pack ice. It wasn't until the fourth try that the Chilean trawler *Yelcho* reached Elephant Island on May 30, 1916. Shackleton, who was standing on the bow, shouted ashore to Wild, "Are you all well?" "All safe, all well!" the boss replied, "Thank God!" All 28 men had survived over two years in the Antarctic.

Shackleton was the force that held it all together.

*For more information on Shackleton and Antarctica, visit* www.coolantarctica.com.

***1916 was the same year Dixon Valve & Coupling Company started. See the next issue for more about our company.***

Map courtesy of Nova/WGBH Educational Foundation. Copyright © 2002. WGBH/Boston.
Photos courtesy of The Royal Geographical Society.



# From the Ground Up

BY DAVID HOLZEL

## Mining coal was always dangerous. Modern technology has transformed mining far beyond picks and shovels.

Think about the Coal Age, and your mind might conjure images of Victorian London, awash in a damp, sooty, deadly fog from a million coal ovens and furnaces. Or war-time Pittsburgh, trapped in the smoke of its coal-fired steel plants, forcing streets to be lit at noon.

But the Age of Coal may actually be today. Worldwide, coal accounts for about 23 percent of total energy consumption and generates over 38 percent of the world's electricity, according to the (U.S.) National Mining Association. The first and third largest coal producers are not in the West. They are in fast-developing China and India, respectively.

Around the world there's a growing reliance on a mineral that started out as a plant 100 to 400 million years ago. Pressure and heat transformed the decaying vegetation, forcing out oxygen and trapping the sun's energy originally stored in the plants as part of photosynthesis. The result was a hydrocarbon, which can be found in seams ranging from a fraction of an inch to hundreds of feet thick—coal.

Photo courtesy of Grubb Photography.

Mining for coal can be as basic as using a pick and shovel. But today's coal mining more closely resembles a factory process. Increasingly it relies on computers and automation, and there is a growing focus on worker safety. So how does the modern coal mining process work?

To begin, there is not a single type of coal. Four basic kinds of coal are determined by their carbon content. The higher the carbon content, the more heat the coal produces. According to the Appalachian Blacksmiths Association (ABA), "The carbon content of coal supplies most of its heating value, but other factors also influence the amount of energy it contains per unit of weight."

**Anthracite** has the highest carbon content—between 86 and 98 percent. A pound of this hard coal can produce nearly 15,000 BTUs of heat, according to the ABA. BTU (British Thermal Unit) is the amount of heat required to change the temperature of one pound of water one degree Fahrenheit at sea level.

**Bituminous** coal "is used primarily to generate electricity and make coke for the steel industry," according to the ABA. It has a carbon content ranging from 45 to 86 percent and a heat value of 10,500 to 15,500 BTUs per pound.

**Sub-bituminous** coal has a 35 to 45 percent carbon content and a heat value between 8,300 and 13,000 BTUs per

**Left: A continuous miner cutting coal**
**Above: A long-wall miner shearing coal**

**Long walls of coal, typically 1,000 feet wide and one mile long, allow mining to continue without having to move equipment, resulting in higher production and lower operating costs.**

pound. Because it has a lower sulfur content than other kinds of coal, it is cleaner burning.

**Lignite** is a "geologically young coal which has the lowest carbon content, 25 to 35 percent, and a heat value ranging between 4,000 and 8,300 BTUs per pound," the ABA says. "Sometimes called brown coal, it is mainly used for electric power generation."

## Mining Methods

Coal is mined both on the surface and underground.

**Surface mining:** Also called "strip mining," this method involves removing the rock and earth covering a coal seam or coal bed. The coal is then extracted. When the overlay proves difficult to remove, drilling and blasting are employed to break up the rocks. This method is called "open pit mining."

The amount of material removed from surface mining may total 10 percent coal to 90 percent rock and soil, according to Joseph W. Leonard, a professor of mining engineering and author of *Anthracite Roots: Generations of Coal Mining in Schuylkill County, Pennsylvania*. When that ration is uneconomical, the alternative is underground mining. "Deep mining removal may range from zero to 50 percent rock and soil," Leonard says.

**Underground mining:** Entry to an underground mine may be through either a horizontal or vertical tunnel. The ore is mined in rooms (stopes), either with mechanical equipment or with drilling and explosives to break the coal into pieces suitable to haul. Columns of coal help support the rooms. This system of support is called "room and pillar."

**Long-wall mining** is an increasingly popular method of underground mining because of its high productivity and economic benefits.

Long-wall mining involves two steps and two sets of equipment, according to Don Shillingberg, a consulting engineer who has worked in the U.S. coal mining industry for 30 years.

First, continuous mining machinery is brought in. This

Photo courtesy of Grubb Photography.

equipment has a large, rotating, drum-shaped cutting head studded with carbide-tipped teeth, which break up the seam of coal. In a long-wall operation, the continuous miner carves out the work area where the coal will be mined, as well as space for a conveyer belt, ventilation and supply entrances.

The long wall itself can be various widths and lengths. A typical long-wall block of coal could be 1,000 feet wide and one mile long. "The basic idea is to get the highest production you can," Shillingburg says. "You want as long a block of coal as you can so you can keep mining without having to move the long-wall equipment to another block of coal. This keeps your operating costs lower and increases profit."

In the second step of the process, the long-wall machinery is brought in and put to work. The computerized equipment requires three or four workers at a time to operate it around the clock, Shillingburg says.

A rotating shear sits on a conveyer that runs the length of the wall. Long-wall mining doesn't rely on the room-and-pillar system of support. "The long-wall miner itself has a hydraulically operated steel canopy [or shield] which holds up the roof and protects miners working at the face," according to the American Coal Foundation.

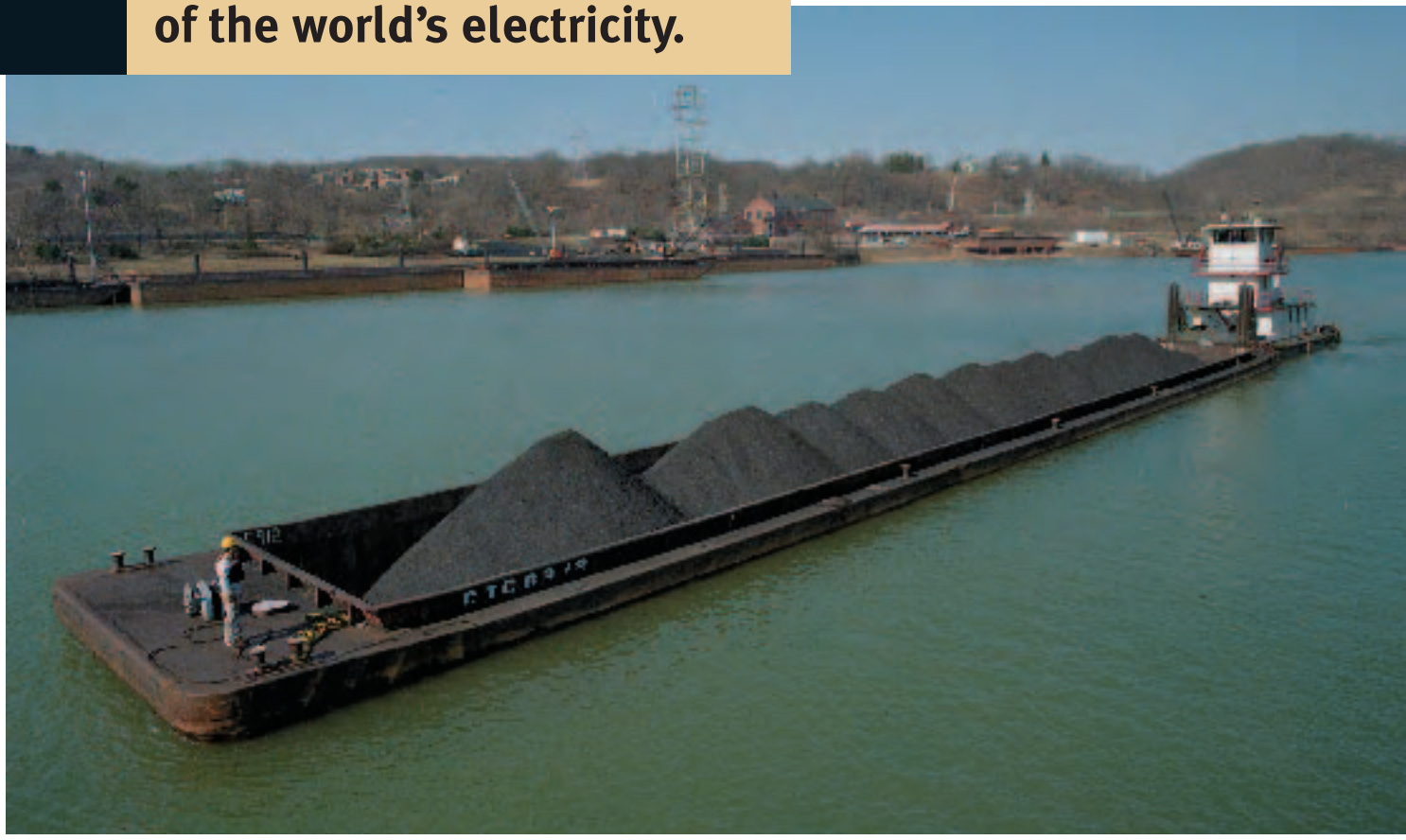
As the process begins, the shear begins to travel the length of the wall. "The cut coal falls into the conveyer belt and is moved out," Shillingburg says. "It gets dumped into a hopper and moved to a processing plant via conveyor belts."

The wider the wall is, the more shields are needed to protect the work area. Arranged side by side, the shields find themselves a distance from the wall once the shear has cut a swath of coal. The computer now signals the hydraulic legs of the canopies to release pressure. "Each shield then pulls itself up, resets and pushes the conveyer belt closer to the wall," Shillingburg says. The legs are re-pressurized to support the roof. The shear operates in this manner back and forth across the face of the wall.

The process is repeated until the long wall has been mined. As the shields advance, the unsupported ceiling behind them collapses.

Once removed from the mine, the coal typically moves on a conveyer belt to an on-site preparation plant. There, dirt, rock and other impurities are removed. Trains and barges are the most economical vehicles to carry coal to its final destination. Utility

**Worldwide, coal accounts for about 23 percent of total energy consumption and generates over 38 percent of the world's electricity.**



**A tug boat pushes a group of coal barges.**

Photo courtesy of Grubb Photography.

plants, among the largest coal consumers, are often built near mines to minimize transportation costs.

## A Rise in Safety

Coal mining historically has been an unsafe—and often fatal—occupation. Mine roof collapses and gas explosions took many lives. Chronic lung diseases, such as Black Lung, caused by breathing coal dust, shortened the lives of workers.

Advances in technology have reduced those dangers in the industrialized world. "Today [mining] is ranked among the safest industrial places to work. Forty or more years ago it was among the most dangerous," Leonard says. He points to improvements in safety, such as roof bolts, to prevent cave-ins. Roof bolts are long steel rods used to bind the exposed roof surface to the rock behind it. Mechanization has increased the speed of mining and, in doing so, lowered the chances of settlement and rock failure, he adds.

The last great coal mine disaster in the United States was in 1968. Seventy-eight miners were killed and another 21 escaped to the surface after an explosion at Consol's No. 9 mine in Farmington, West Virginia. The catastrophe prompted a national uproar and new safety legislation.

The following year, 203 coal miners died in the United States. In 1994, fatalities had dropped to 28.

"Coal mining today would best be described as a factory process," Leonard says. "Deep mine productivity went from a few tons to 30 to 1,000 tons per man per day." The wide range is due to a variety of factors at a particular site.

To gauge how far coal mining has come in the developed world, you just need to look at the news coming from China, the world's largest coal producer. In 2004, *The Washington Post* reported: "By the [Chinese] government's own reckoning, more than 6,700 miners died in accidents last year, about 18 per day—and experts say the real figure is probably twice that." The fatality rates in China's mines are as much as 350 times those in other parts of the world, according to *The Washington Post* article.

Those deaths came in explosions, roof collapses and floods, *USA Today* reported. Responding to water seepage is a high priority in mine safety. Water must be pumped out—as much as 18 tons of water per ton of coal mined, Leonard says—and visible fissures sealed.

Such scenarios were just as routine a generation ago in industrialized countries. Today, with computers, walking umbrellas and cutting shears that can travel for miles, coal can be mined without a pick and shovel in sight.



Photo courtesy of Grubb Photography.

### Environmental Changes Through Gasification

Gasification has been in commercial use for more than 50 years as a process technology for the refining, chemical and power industries. The gasification of coal may play a key role in reducing countries' dependence on foreign oil.

The gasification process converts any carbon-containing material, such as coal, into a synthesis gas composed primarily of carbon monoxide and hydrogen, which can be used as a fuel to generate electricity or steam or used as a basic chemical building block for a large number of uses in the petrochemical and refining industries. Gasification adds value to low- or negative-value feedstocks by converting them to marketable fuels and products.

When linked with modern combined cycle turbines, gasification is one of the most efficient, environmentally effective means of producing electricity from solid or liquid feedstocks.

Air emissions from an Integrated Gasification Combined Cycle (IGCC) power plant are far below U.S. Clean Air Act standards, and sulfur removal efficiencies of more than 99 percent are achievable. As air emissions standards become more strict, the superior environmental performance of IGCC will take on added economic benefits because the technology can achieve greater emissions reductions at lower cost than less advanced technologies.

*Information provided by the Gasification Technologies Council,* www.gasification.org.

# Top Coal Producing Countries

***(2004 figures, in metric tons)***
**From the World Coal Institute**

### Major Producers of Hard Coal (2004e)

| | |
|---|---|
| China | 1,956 Mt |
| United States | 933 Mt |
| India | 373 Mt |
| Australia | 285 Mt |
| South Africa | 238 Mt |
| Russia | 210 Mt |
| Indonesia | 129 Mt |
| Poland | 100 Mt |
| Kazakhstan | 83 Mt |
| Ukraine | 62 Mt |

***Metric ton***
*Approximately 2,200 pounds in the English system of measurements. In the international system of measurements, 1 metric ton = 1,000 kg.*

*Source: U.S. Nuclear Regulatory Commission*

### Global Hard Coal Consumption

| | 1984 | 1994 | 2004e |
|---|---|---|---|
| World | 3,066 Mt | 3,541 Mt | 4,646 Mt |
| *Selected Regional Aggregate Estimates* | | | |
| Europe | 17% | 12% | 8% |
| Former Soviet Union | 18% | 10% | 6% |
| North America | 22% | 23% | 21% |
| Asia-Pacific | 38% | 50% | 60% |

### World Coal Production *(in millions of short tons)*

*Source: U.S. Energy Information Agency*

| | |
|---|---|
| 2004e | 4,629 Mt* |
| 2003 | 4,231 Mt |
| 1980 | 2,805 Mt |

**a 9.4% increase in production over the previous year & 65% growth over the past 25 years.*

# No Such Thing as Business Ethics

By Michael Josephson

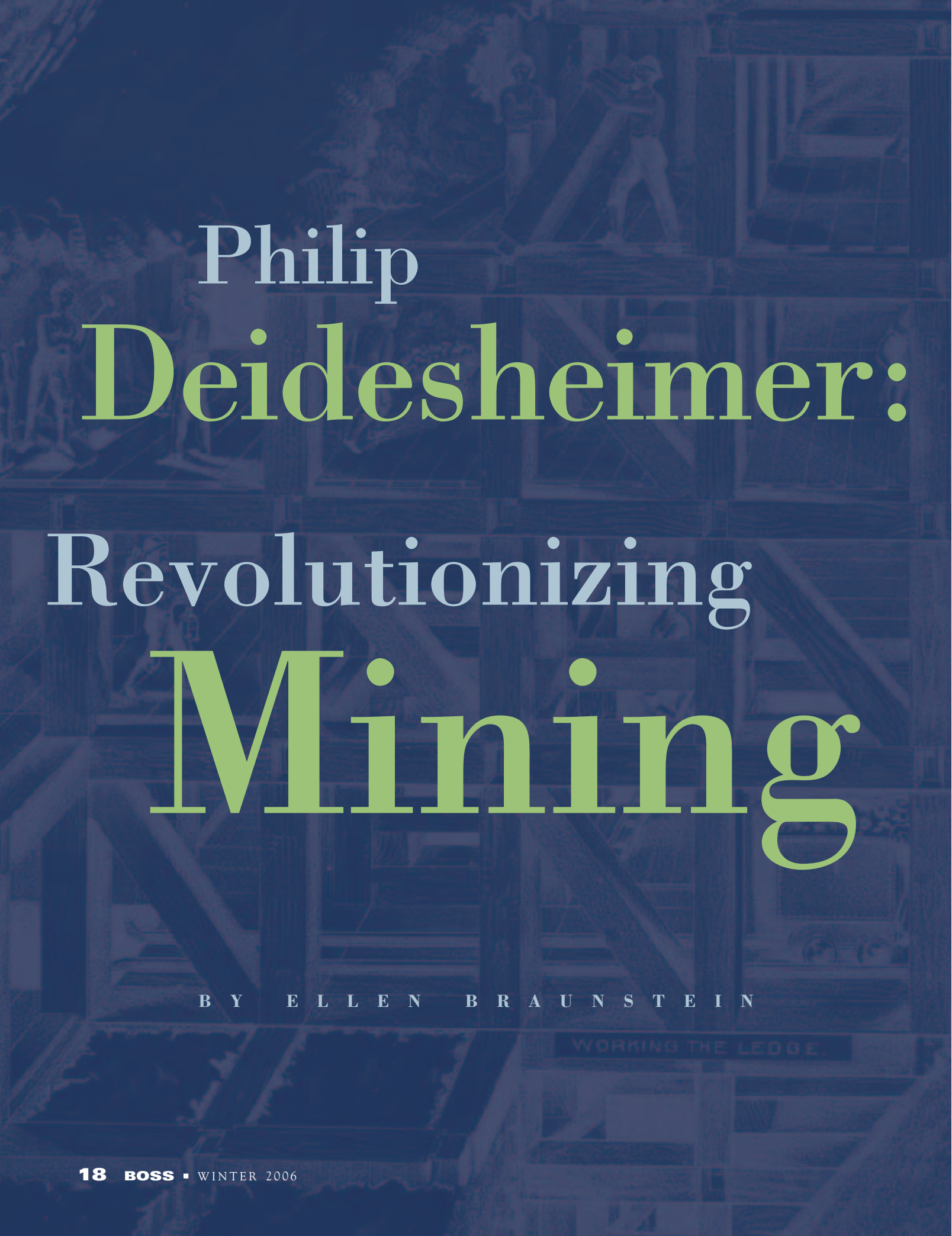
During a workshop for a Fortune 100 company, I made what I thought was an uncontroversial point that beyond a legal obligation to keep promises and honor contracts, there is an ethical duty; it's a part of being trustworthy. A senior executive objected strenuously.

"Whether the company wants to live up to its commitments is a business decision, not an ethical one," he said. In fact, he said, the company had a responsibility to evaluate whether it was in its best interests to honor or breach contracts, and the decision should be based on a simple cost/benefit analysis. Ethics was not an issue.

Under this theory, whatever works is right. It makes the pursuit of self-interest the proper standard for business judgments. This theory of "business ethics" flourishes because many people compartmentalize their lives into personal and business domains, assuming each is governed by different standards of ethics. In business, the argument goes, ethical principles like trustworthiness, respect, responsibility, fairness, caring and good citizenship are simply factors to be taken into account. They're not moral obligations.

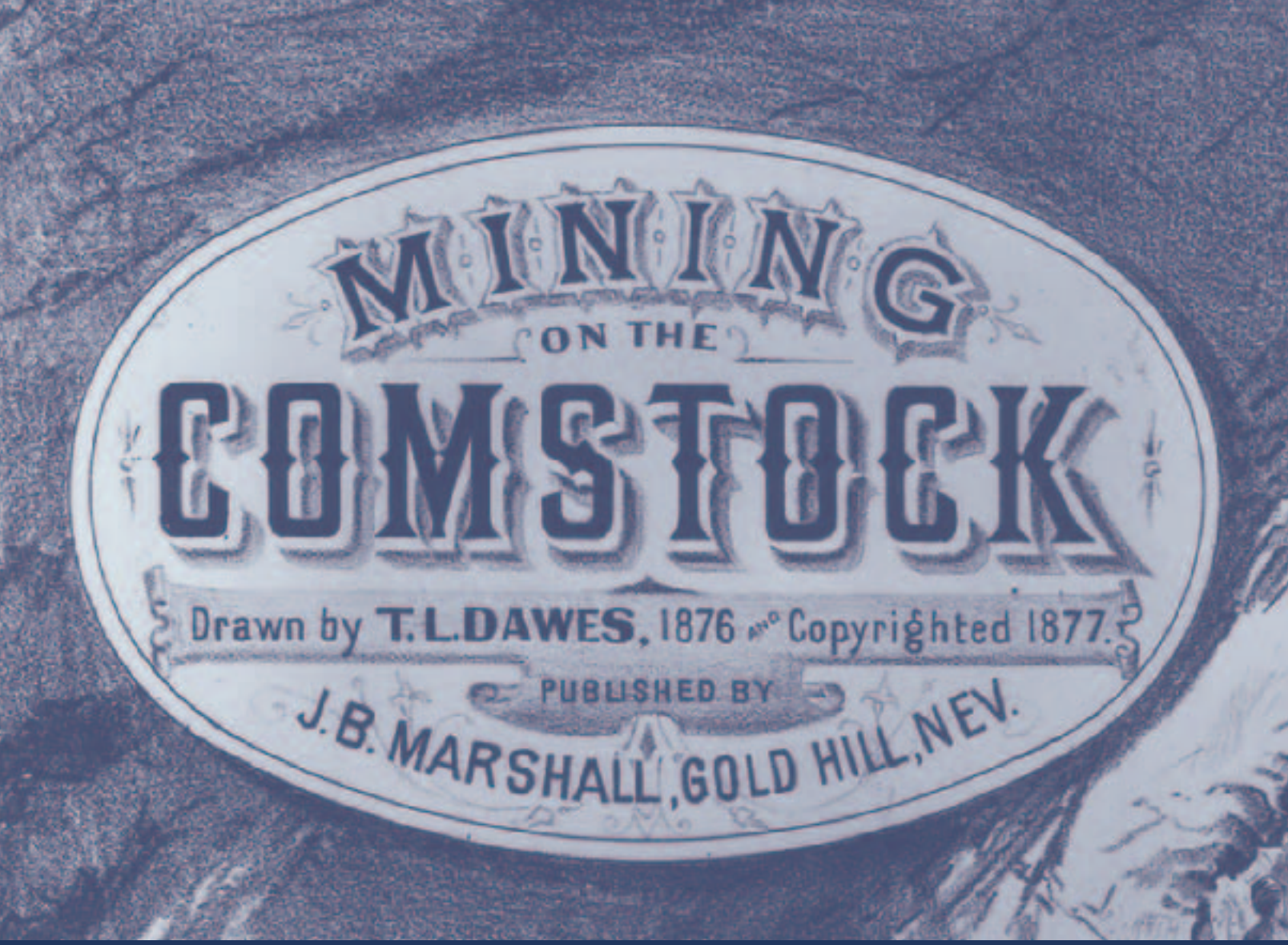
As a result, fundamentally good people, who would never lie, cheat or break a promise in their personal lives, delude themselves into thinking that they can properly do so in business. This rationale is fatally flawed.

Ethics is not concerned with descriptions of the way things are but prescriptions of the way they ought to be. Though we may face different sorts of ethical challenges at work, the standards do not change when we enter the workplace. There is no such thing as "business ethics" – there is only ethics.




# Philip Deidesheimer: Revolutionizing Mining

BY ELLEN BRAUNSTEIN




The Comstock Lode in northwestern Nevada was the most important mine in the world from 1860 to 1880. The huge geological formation yielded silver and gold worth $400 million in the 1800s (equivalent to $9.4 billion in 2005) and influenced mining methods into the 20th century.

But the ore was deep and difficult to mine. Blistering heat, flood water and cave-ins killed or injured miners. When miners broke through rock, underground water flooded the tunnels, often with deadly consequences. As mines went deeper in the Comstock, the flood water steamed and scalded the miners, who already suffered from blistering heat. Many quit. The Comstock would have shut down were it not for the innovative techniques developed by a handful of engineers.

Phillip Deidesheimer, a German engineer, could be counted among those innovators. The Comstock is where Deidesheimer made one of the most valuable contributions in history to mining safety and efficiency, historians say.

His invention, a revolutionary timber-framing system known as the square set, allowed Comstock miners to keep soft walls of fractured rock and clay supported while they extracted large bodies of ore from deep below the surface.

"All the mines were unsafe. Square-set timbering made them safer," said Jack McCoy of Philipsburg, co-author of a book on ghost towns of Granite County, Montana. Philipsburg, the county seat, was named after Philip Deidesheimer, a mining and mill superintendent there from 1866 to 1868.

Deidesheimer was born to Jewish parents in Darmstadt Hess, Germany in 1832. At the age of 20, he graduated from the prestigious Freiberg School of Mining in Germany. He was one of an elite group of European engineers sought by mining companies in the American West in the 1840s and 1850s.

That was mining's romantic era, said Daniel Meschter, a Philipsburg newspaper columnist, geologist and mining historian, who can enchant a listener with legendary stories of miners from that period. The feverish mining for gold and silver brought on by the 1949 California Gold Rush could, though rarely, make a man enormously wealthy overnight, he said.

"It was a time when mining engineers could make a big contribution," he said. "Nowadays, they are civil engineers. The romance has left."

Deidesheimer sailed to America around Cape Horn, no doubt in response to this opportunity, Meschter writes in *Flint Chips: Tales of Flint Creek Valley*. Meschter's collection of 177 history columns originally appeared in the *Philipsburg Mail* from 1985 to 1989.

Arriving in 1851, Deidesheimer spent the next nine years in Eldorado County, California, working as an assayer. Assaying is the technical skill of determining how much gold is in a piece of ore. Deidesheimer also supervised the opening of underground gold mines and built and managed stone and silver amalgamation mills in Montana.

Most important, Deidesheimer worked with other engineers to mechanize placer mining of gold and silver veins that were exposed by erosion. Placer miners, namely the '49ers, extracted tiny pieces of ore from masses of sand, grit and gravel. They hand sluiced or panned for gold in streams. Engineers of the day developed sophisticated machinery that would process huge quantities of gravel, taking advantage of the high specific gravity of gold, Meschter said. Ultimately, floating dredges would sort the material, sending huge amounts of silt and sand downstream. Laws enacted in the 1860s and 1870s attempted to limit the environmental harm caused by large-scale placer mining.

On July 1, 1859, miners struck a bonanza of silver and gold in northwestern Nevada. Hundreds of gold miners abandoned their spent claims and rushed eastward across the Sierra Nevadas to Silver City, Virginia City and other boomtowns.

Henry Comstock, a miner with a reputation for swindling, stumbled into the initial discovery. He tricked two Irishmen into getting a cut of their claim by saying they were trespassing on his ranch. He became one of the most conspicuous claim holders, and the ore deposits came to be known as the Comstock. Mr. Comstock sold out for too little. He subsequently went insane and committed suicide.

Silver miners at the Comstock were having trouble holding the ground. No one there had ever seen such wide ore veins in deep mines—up to 60 feet across, said David Davis, a spokesman for the Nevada Bureau of Mines and Geology.

To extract ore from narrow veins, miners supported tunnels with a basic post and cap method of timbering—a stick along here, a stick along there.

For the wide veins of the Comstock, timbers were neither long enough nor strong enough to support caverns cleared of ore. The ground pressure felled the pine columns like pick-up sticks. Miners were dying or quitting from the heat and cave-ins. "Not many mines were in the condition the Comstock was. The surrounding rock would cave in as fast as the miners could get the ore out," said Joseph V. Tingly, research geologist emeritus at the Mackay School of Mines in University of Nevada in Reno.

William F. Babcock of the Ophir Company asked Deidesheimer to come to Virginia City in November 1860 to look into the problem of timbering wide veins. "They had to have an engineer create something to fill the void after creating the void," said Ronald James, Nevada State Historic Preservation Officer and author of a history of Virginia City and the Comstock Lode.

According to Meschter, "Deidesheimer freely gave his invention to the world without applying for the patents that might have assured him financial security."

Meschter writes that Deidesheimer is said to have told a

Photo this and previous page courtesy of the Montana Historical Society.

## Square Set Mining

The ore discovered in 1859 at the Comstock Lode was so crumbly it could easily be excavated by a shovel.

That was the upside of mining the largest silver find in U.S. history. The downside was cave-ins, among other deadly conditions.

Ore deposits, typically narrow, often run a few inches to several feet wide along a tunnel. That is why they are called veins. No one had ever seen such wide ore veins before the Comstock. However, the ore rock could easily be braced with simple shoring and beams.

But by late 1860, Ophir mine workers had sunk a shaft 180 feet deep to mine a vein 45 feet wide. The ore rocks were in large masses of quartz surrounded by a wet, clay-rich material that became unstable when exposed to air.

As the ore was removed, the clay began to swell. The pressure would bend and break the most carefully laid timbers. The walls and roofs would collapse with amazing speed and crush the miners instantly under tons of rock.

The Comstock mines would have closed were it not for the development of a timber-framing method known as the square set.

German engineer Phillip Deidesheimer designed a system of intricate interlocking cubes that provided more stability than traditional timbering. He had the cubes assembled with strong massive timbers, four to six feet wide on a side. The timber framing, set in steps, could wander wherever the miners wanted to excavate and still maintain strength and support. The cubes gave the miners a working surface from which to take out the next layer of ore.

Deidesheimer told people that a honeycomb inspired the design of his square set. He noticed that the cubes were remarkably light yet provided substantial support.

Often the cubes were refilled and strengthened with waste rock from other diggings after the ore removal was complete.

The square sets allowed the mine shafts in this huge geological formation to be sunk to great depths, up to 3,000 feet. Square sets were quickly applied throughout the west and worldwide.

But square sets were expensive and slow to build. They required lumber, transportation and highly skilled laborers and supervisors to construct the frames. Huge lumbering operations stripped the forests around Lake Tahoe.

At the time, there was no alternative.

The square set would be the standard for international mining until the turn of the century. By the 1900s, steel replaced the need for wood, and earth-moving machinery paved the way to open pit mining. More efficient and safer methods such as rock bolting, steel mesh and steel plates, made the square set timbering system passé.

**Above photo: Square set timbers, 1897.**
**Illustration: Men working in the Comstock Lode, a silver and gold mine in Virginia City, Nevada, the first industrial city in the west.**

friend, "If all goes well and these square sets protect the lives of the miners, what more could a man ask for?"

Deidesheimer's concern for safety saved lives at a time when some owners valued more his contribution to the bottom line, Meschter said.

Deidesheimer became the superintendent of the Ophir Mine. In a few years, he fell out of favor with management because he sided with miners in labor disputes, Meschter wrote.

He left for Montana in mid-1866 and accepted a similar position with the St. Louis and Montana Mining Company. He again displeased management with his favorable treatment of workers, Meschter wrote. He also presided over a mill in that area that came to be known as Granite County. A community of 200 miners and families named their town Philipsburg after the man with a German mouthful of a name.

When Deidesheimer returned to Virginia City in 1868, he found easy employment with mining companies whose owners exploited his reputation to boost stock prices. "They would have him on the masthead to approach potential stock investors," James said.

Ultimately, Deidesheimer went broke. He lost heavily in the stock market crash of 1875 and declared personal bankruptcy.

He resurfaced in San Francisco at age 43 and started anew as a surveyor. He completed the engineering survey for an innovative project that brought water from Lake Tahoe to San Francisco.

Well into his 70s, and dealing in real estate, Deidesheimer lost everything in the San Francisco earthquake of 1906. Meschter wrote that he was reported destitute and ailing in 1912 in a cheap hotel room. He died on July 21, 1916.

"In the end, Deidesheimer was a lonely and forgotten man, Meschter said. "He received from life less than he deserved."

# BRITAIN:
## THREE COUNTRIES IN ONE

STORY BY THEODORE FISCHER

**BRITAIN, A 93,000-SQUARE-MILE ISLAND OFF THE NORTHWEST COAST OF EUROPE, CONSISTS OF THREE DISTINCTIVE REGIONS THAT USED TO BE SEPARATE COUNTRIES BUT NOW BELONG TO AN ALLIANCE KNOWN AS THE UNITED KINGDOM. ENGLAND, LAND OF SHAKESPEARE, DICKENS, CHURCHILL AND THE BEATLES, OCCUPIES OVER HALF THE ISLAND AND OFFERS THE COSMOPOLITAN APPEAL OF LONDON AND GENTLE LANDSCAPES LOADED WITH HISTORICAL TREASURES. FAMED FOR WHISKEY AND KILTS, SCOTLAND HAS PRESERVED WELL ITS MAGICAL CASTLES AND BREATHTAKING—REMEMBER *BRAVEHEART*?—VISTAS. STILL FIERCELY INDEPENDENT AND BILINGUAL (WELSH AND ENGLISH), WALES IS DENSE WITH OLD FORTRESSES BUILT TO FEND OFF THE ENGLISH AND BRIMMING WITH VIBRANT EXPRESSIONS OF WELSH CULTURE.**

# MOST VISITS TO ENGLAND BEGIN IN LONDON,

a sprawling metropolis whose 9 million people make it the largest city in Europe. Although an influx of new citizens from around the globe has turned today's London into the least English of England's cities, all the great old sights remain and some great new ones have been added.

London's venerable A-list attractions begin with Buckingham Palace, which has been the monarchy's ceremonial residence since 1837 but open to visitors only since 1993. Both national museum and national church, Westminster Abbey is where monarchs come to be crowned and to be buried. A former residence and prison, the 1,000-year-old Tower of London displays the British crown jewels, and the United Kingdom enacts laws at the Houses of Parliament, featuring Big Ben. Covering over 80 acres, the British Museum displays more than 4 million items in 90 galleries. And as domed cathedrals go, the magnificent St. Paul's Cathedral is smaller than only St. Paul's in the Vatican. London's newest must-see attraction is the London Eye, a 443-foot Ferris wheel—the world's largest—built alongside the Thames River to mark the Millennium.

London is equally renowned for its public parks and gardens, notably Hyde Park and Kensington Gardens where sports teams and soapbox orators gather. And, Kew Gardens is considered the world's most comprehensive collection of botanic specimens.

For more specialized interests, London has the Sherlock Holmes Museum honoring the fictional detective and a preserved 18th-century prison known as The Clink. The London Transport Museum displays everything from horse-drawn omnibuses to vehicles for subway-tunnel miners, and Vinopolis focuses exclusively on wine.

You can travel around London by taxi, by subway (or "tube"), by foot and, perhaps most enjoyably, on tours using the classic red double-decker buses. Options for daytrips and half-day getaways include cruises down the Thames to Greenwich, to see the observatory where time begins; jaunts to Windsor, official royal residence for the last 900 years; and expeditions to the nearby university towns of Oxford and Cambridge.

While London restaurants serve virtually every cuisine on earth, its strongest suits are Cantonese, Indian, Italian and Greek. Over 7,000 pubs serve sandwiches and English-style meals, many of them a cut or two above typical "pub grub." The best places to enjoy a classic English afternoon tea—tea plus an assortment of sandwiches and pastries—are the better hotels and fashionable department stores.

For entertainment, the West End rivals Broadway with some 50 venues for musicals and plays. And a reconstruction of Shakespeare's Globe Theatre offers guided tours and matinee-only performances. Swinging

## Weather Forecast

Britain's weather is quite changeable. Britain does not usually receive long periods of hot or cold weather, or long periods of prolonged drought or rainfall. Britain's climate is usually that of cool summers, steady rainfall and mild winters.

Temperatures in Britain reach an average of 7°C (45°F) in the winter months between December and March. During the summer months of June to August, temperatures average 22°C (72°F).

London still exists with rock, blues, jazz and world music in pubs and bars all over town, and dozens of dance clubs open from midnight to dawn.

But to savor the real Merry England, you have to get out of London. One highly recommended getaway is Cotswolds, a 50-mile range of limestone hills some 120 miles west of London where stone cottages fill storybook villages, and pastures are full of grazing sheep. The Cotswolds' preserved villages, are the happy unintended consequence of an Industrial Revolution migration that devastated the local wool industry and sent the capital that might have modernized the area to cities further north.

You can roam the Cotswolds by car, by bike or by foot–villages are seldom more than three miles apart. Cotswolds highlights include the market town of Chipping-Camden, home of wealthy wool merchants; windswept Stow-on-the-Wold, the Cotswold's highest point; and the spa town of Cheltenham.

## SCOTLAND

Edinburgh, Scotland's political and cultural capital, is split into two distinct sections. Old Town, to the south, consists of convoluted streets and twisting alleys of Edinburgh's medieval past. Looming over Old Town, astride a volcanic rock, stands Edinburgh Castle, a royal residence and impregnable fort since the 11th century and now repository of the Scottish crown jewels. Other Old Town sites are situated on or near the Royal Mile, a succession of four streets—Castlehill, Lawnmarket, High and Canongate—along a ridge connecting the castle and the Palace of

**(clockwise from top) Tower Bridge, London; The London Eye at night, South Bank; Black cabs and red double-decker buses on a busy London road; England's football is the country's national pastime; House of Parliament, Westminister, London.**

All photos courtesy of Britainonview.com.


Holyroodhouse, home to the Royal Collection of art and the Queen herself when she's in town. Highlights of the Royal Mile include the massive Museum of Scotland, the Museum of Childhood (known as the world's noisiest museum) and the Scotch Whisky Heritage Center, where tours begin with a wee dram.

Attractions in New Town, laid out back in 1776, include a meticulously refurbished Georgian House that typifies this orderly neighborhood. The National Gallery of Scotland has over 20,000 pieces, with an emphasis on the European masters, and the Sir Walter Scott Monument honors the Edinburgh-born author (*Ivanhoe, Rob Roy*) dubbed father of the romantic historical novel.

In terms of live entertainment, the highlight of the Scots' year is the Edinburgh Festival, three weeks in August when specialized festivals collectively produce the world's largest celebration of the arts. But Edinburgh has plenty of nighttime entertainment the other 49 weeks, with jazz, folk and rock music in the pubs, Scottish folk evenings complete with kilts and bagpipes in hotels and a pair of reasonably frightening ghost walking tours.

Glasgow is a larger newer city known for its 19th-century industrial might—coal-fueled ironworks, cotton mills and shipbuilding—and upbeat friendly citizens. Top stops include the 13th-century Glasgow Cathedral, the Burrell Collection of art amassed by local ship owner Sir William Burrell and the Museum of Transport with its vintage cars, trolley buses, antique bicycles and model ships.

If you have a chance, head for the Highlands—it's hard to miss since this stunning landscape of mountains, glens

**(clockwise from top) Biking at St. Monance; Edinburgh Castle in Lothian, Scotland; Bottle of whisky on sale at the Museum of Scotland; Market street in Edinburgh.**

All photos courtesy of Britainonview.com.

and lochs (lakes) enclosed on three sides by rugged coastline occupies the northern two thirds of Scotland. Use Inverness, the administrative capital and home of the Scottish Kiltmaker Visitor Centre, as point of departure for Highlands excursions. Check out Loch Ness, the deep, dark home (maybe) of the infamous monster known as "Nessie." Head out to Glen Nevis, a glacial valley dotted with shaggy Highland, and scale Ben Nevis, Britain's highest peak at 4,406 feet. Rail buffs can survey the territory from the classic coaches of the West Highland Railway, a steam train that portrays the Hogwarts Express in Harry Potter films.

## WALES

Cardiff, a progressive businesslike city on Wales' south coast, evolved around the site of an old Roman fort, ranked as the world's busiest coal-exporting port in 1913 and became the first capital of a semi-autonomous Wales in 1955. At the heart of town lies Cardiff Castle, a 12th-century, 12-sided stone fortress gussied up with exotic Arab, Gothic and Greek interiors. The nearby National Museum of Wales displays the great art of Wales and Continental masters, but sports fans might prefer a guided tour of Millennium Stadium, a 72,500-seat retractable-roof structure built in 1999 to host the Rugby World Cup which serves as an icon of Welsh nationalism.

The south, however, is the most "English" part of Wales, and the most characteristically Welsh historical, cultural and natural attractions are found in North Wales. Visit Caernarfon Castle, the massive harbor-side fortress where Prince Charles, who as heir to the U.K. throne rates the title Prince of Wales, received his investiture in 1969. Visit the soaring Snowdonia Mountains and either hike to the top of Mount Snowdon, Britain's highest peak outside Scotland, or ascend via

*An English breakfast*

## Peculiarly British Food and Drink

**English breakfast**
A hearty meal that may include bacon and a fried egg, mushrooms, sausage, tomatoes, black pudding and fried bread.

**Ploughman's lunch**
A pub dish, usually bread, cheese (or ham or pâté), pickles and salad.

**Bangers and mash**
Fried sausages and mashed potato.

**Shepherd's pie**
Minced lamb baked with potato crust; called "cottage pie" when beef replaces lamb.

**Kedgeree**
Curry-flavored smoked haddock, hard-boiled eggs and rice.

**Scotch egg**
Hard-boiled egg covered with sausage meat, eaten cold.

**Cockles and whelks**
Inexpensive shellfish dish sold in outdoor stalls.

**Cornish pasties**
Meat and vegetables baked into a pastry crust.

**Haggis**
Scottish dish made from sheep's heart, lungs and liver chopped with onions, suet and boiled in its stomach bag.

**Toad in the hole**
Sausages baked in pancake batter.

**Bread and butter pudding**
Buttered bread slices baked with dried fruit, milk and eggs.

**Treacle pudding**
A steamed sponge pudding topped with syrup and custard.

**Fruit fool**
Cooked soft fruit combined with cold custard or cream.

**Draught bitter**
Most popular British beer, served at room temperature.

**Trifle**
Layers of sponge cake, jelly, fruit, custard and cream.

**Shandy**
A 50/50 mixture of beer and ginger beer, ginger ale or lemonade.

# More British Treasures

*View of the Roman Baths, Bath, Avon*

**Avebury**
A Stongehenge-like circle of ancient stones visitors can reach out and touch.

**Bath**
English resort town with bathhouse in operation since Roman times plus state-of-the-art spa facilities.

**Blackpool**
England's rollicking Irish Sea version of an amusement park.

**Hadrian's Wall**
A Roman emperor's ambitious attempt to regulate trade – not deter invasions – between Scotland and England.

**Harrods**
Vast 150-year-old London department store that stocks the best of everything.

**Ironridge Gorge**
Severn River Valley hub of heavy industry with museums on bridge building, iron smelting, and other Industrial Revolution enterprises.

**Isle of Skye**
Largest of west Scotland's Inner Hebrides Islands, with rugged volcanic landscape and legendary whisky – from uisge beatha, Gaelic for "water of life" – distillery.

**Liverpool**
The Beatles' working-class hometown offering "Magical Mystery" tours and entry to Lennon's and McCartney's boyhood homes.

**Lost Gardens of Heligan**
In Cornwall on England's southwestern tip, Europe's largest restored garden.

**Stratford-upon-Avon**
Home of Shakespeare and the Royal Shakespeare Company as well as pleasant place to visit.

**Wye Valley**
Scenic Welsh area that once supplied charcoal for local ironworks and later inspired Romantic poets.

**York**
Well-preserved medieval city with largest Gothic church north of the Alps.

the Snowdon Mountain Railway. Ride the funky steam-hauled, narrow-gauge Ffestiniog Railway from Porthmadog Harbour to the slate-mining town of Blaenau Ffestiniog.

With no major cities, northern Wales accommodations consist mostly of small hotels and British-style B&Bs. Best places to find them are towns of Conwy, Caernarfon, Betws-y-Coed (pronounced "betoos-ur-coyd"), Llanberis and Llandudno.

## BRITAIN—ENGLAND, SCOTLAND AND WALES—THREE DISTINCTIVE REGIONS FILLED WITH HISTORY AND CULTURE.

### BRITISH COAL FUELS INDUSTRY AND TOURISM

The phrase "carrying coal to Newcastle" became a metaphor for doing something utterly pointless because during the 19th century, Newcastle, in the northeast of England, was the hub of Britain's thriving coal industry. Coal has long been Britain's richest natural resource, serving as the principal fuel of the Industrial Revolution and still fulfilling a large proportion of United Kingdom's (U.K.) energy requirements.

While Britons have mined coal since Roman times, the coal industry really began in the 16th-century Elizabethan era when forests that had provided heating fuel were depleted to supply timber for the English navy. In the 19th century, coal and coke from the great British coalmines—or collieries—fueled the steam engines and steel mills that built the Industrial Revolution.

Britain's mainly bituminous coal reserves are concentrated in the northern England counties of Northumberland, Durham, Nottinghamshire and Derbyshire; important deposits are also located in southern Scotland and southern Wales. Bituminous coal is a soft coal that is derived from petroleum and found in substances such as asphalt and tar. British coal production peaked in 1913, when the U.K. produced 287 million tons and employed about one million workers. In 1947, when the coal industry was nationalized, it was producing only 197 million tons. Under private ownership again since 1995, Britain now produces less than 30 million tons a year.

While the British coal industry may have declined, a growing number of mining-related attractions in all three regions of Britain tell the story of coal mining and examine the lives of miners:

**National Coal Mining Museum for England,** Wakefield, England. Exhibits on mining life and equipment plus tours of one of Britain's oldest working mines.

**Scottish Mining Museum,** Newtongrange, Scotland. Displays on the history of Scottish coal and tours of the 19th-century Lady Victoria Colliery.

**Big Pit: National Mining Museum of Wales,** Blaenafon, Wales. Guided tours of a modern colliery, audiovisual presentation on mining history, restored pithead baths and museum exhibits.

**Below, A contestant at the Braemar Gathering. Right, Cardiff Castle.**

All photos courtesy of Britainonview.com.

# Pass the Spinach, Please

*Vitamin A is Essential to Good Health*

By Karen Baxter

The next time you feel a cold coming on, treat yourself to some liver, sweet potatoes or spinach with that glass of orange juice.

All three foods are rich sources of vitamin A, a nutrient, which according to a Pennsylvania State University study, may help make interferon—a natural immune-system booster produced by the body—more effective in fighting diseases like arthritis and multiple sclerosis and the common cold.

Vitamin A, a family of fat-soluble compounds, is best known for its crucial role in promoting vision, particularly night vision. But vitamin A does more than help you see in the dark. It has a host of other health benefits, from promoting bone growth to fighting acne.

## Sources

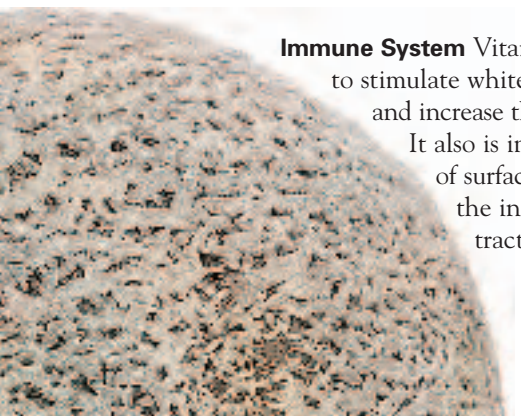
Retinol—or preformed vitamin A—is one of the most active, usable forms of vitamin A and is found in animal products including liver, whole milk, eggs, margarine, cheese and in some fortified foods like cereal.

Provitamin A carotenoids, most notably beta carotene, are dark colored pigments found in plants, which the body converts to vitamin A. Carrots, spinach, kale, sweet potatoes, cantaloupe, mangoes, apricot and peaches are examples of plant foods that contain beta carotene.

## Benefits

**Eyes** Vitamin A plays an essential role in vision by assisting in the functioning of the retina and maintaining the health of mucous membranes in the eye.

**Skin** Topical and oral solutions containing synthetic vitamin A (like Retin-A) are used to clear up acne and psoriasis and may be useful in treating other skin conditions like premature aging and warts. Vitamin A is also used to treat cold sores and flaky scalps.



**Immune System** Vitamin A has been shown to stimulate white blood cell function and increase the activity of antibodies. It also is important in the health of surface linings like those in the intestinal and respiratory tracts.

**Measles** The World Health Organization recommends the use of vitamin A supplements to children with measles in developing countries where vitamin A deficiency is widespread. The supplements have been shown to decrease the severity and complications of the disease.

**Bones** A balanced intake of vitamin A is needed for normal bone development. Both too low and too high doses have been linked to osteoporosis.

**Cancer** Vitamin A and beta carotene may be associated with decreased risk of certain cancers, including breast, colon and cervical cancers.

## Supplements

The U.S. Recommended Daily Allowance (RDA) for vitamin A for an adult is 700 to 900 micrograms of retinol or the equivalent beta carotene intake. Three ounces of cooked beef liver contain 545 percent of the RDA, while one-half cup of boiled carrots provide 270 percent.

If you obtain the suggested RDA of vitamin A from your diet, there is no need to use supplements, according to researchers. In fact, it's not a good idea to use vitamin A supplements unless directed by your doctor, especially if you

smoke or are pregnant, says Roberta Anding, a registered dietician and spokesperson for the American Dietetic Association.

Researchers are studying a link between high doses of vitamin A and osteoporosis. Other possible risks include liver abnormalities, central nervous system disorders and even death.

"Preformed Vitamin A can be toxic at about 10 times the recommended daily allowance," Anding says. "And it can be teratogenic, meaning it can cause birth defects."

Taking a beta-carotene supplement is a safer choice than a vitamin A supplement, because it doesn't build up in the body. (Although too much can turn your skin an orange color.) Generally speaking though, a person who eats their five daily servings of fruits and vegetables, and varies their selections, shouldn't have to worry about getting enough of the nutrient.

## Deficiency

Vitamin A deficiency is rare. However, Anding says she has seen it in patients who have come from developing countries or countries with widespread famine.

Approximately 250,000 to 500,000 malnourished children in developing countries go blind each year from vitamin A deficiency, according to the National Institutes of Health. Children with vitamin A deficiency are also four times more likely to have asthma and are at risk for chronic lung disease, hearing loss, measles, anemia, pneumonia and stunted growth.

In adults, vitamin A deficiency may also lead to skin, bone, lung and immunity problems and anemia, and in pregnant women, low birth weight and premature birth.

The elderly and people on low-calorie diets, vegetarian diets low in beta carotene, or people with chronic diarrhea or excess alcohol consumption are more prone to vitamin A deficiency.

## Food Preparation

To ensure you're getting the most benefits out of vitamin A and beta carotene-rich foods, take measures to prevent loss of the nutrients during preparation, cooking or storage. Keep vegetables covered and refrigerated during storage. When possible, serve fruits and vegetables raw or steamed to preserve the most nutrients. In addition, baking or broiling meats is healthier than frying foods.

# The Turn of the Screw: A Brief History

By Karen Baxter

It's easy to take the screw for granted. Most people don't even think about screws until they need to take the cover off of a toy's battery compartment or until an arm falls off their eyeglasses.

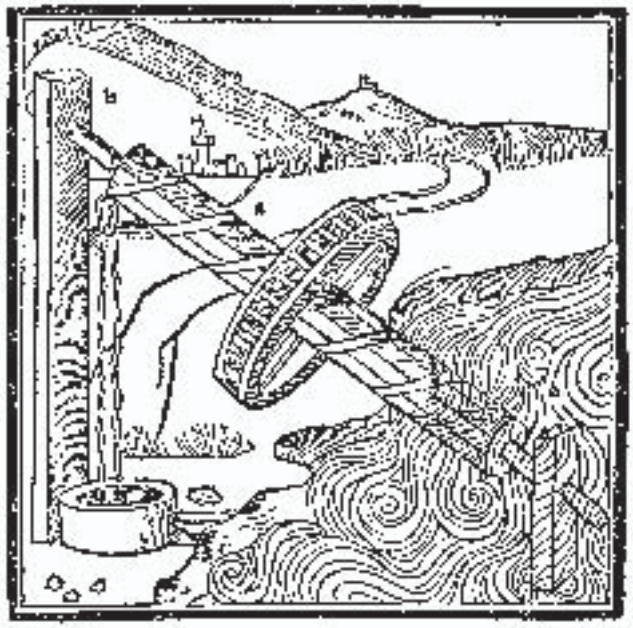
So, it may be surprising that in the wake of Y2K, when asked to write an essay on the most important tool of the millennium for *The New York Times*, author Witold Rybczynski, professor of urban studies at the University of Pennsylvania, chose the screw as his subject. (Rybczynski went on to write the book *One Good Turn: A Natural History of the Screwdriver and the Screw.*)

The origins of the screw can be traced all the way back to the Greek scientist and mathematician Archimedes, born in the third century B.C. Archimedes invented the first planetarium, the lever, the catapult and the compound pulley system. He also is credited with the creation of the hydraulic screw pump, which was used to raise water from a low-lying body of water to irrigation ditches.

Other screw-type machines like the olive press, which used Archimedes' helix design, were used as early as first century A.D. However, it wasn't until the 15th century that wood screws used as fasteners first appear in historical accounts. Around that time, gun and armor manufacturers began using them instead of nails to get a better seal between seams and joints. It was also in the 15th century that Leonardo da Vinci drew a sketch of a screw-making machine.

According to Rybczynski, the first screws were made by hand with files. Because of the labor involved in their creations, they were expensive and not used around the house or in large quantities.

That began to change when English instrument maker Jesse Ramsden invented the first screw-cutting lathe in 1770. The household screwdriver appeared around 1780. Then, in the late 1790s, Englishmen Henry Mudslay and



**A woodcut of Archimedes' hydraulic screw pump from an edition of Virtruvius's *De Architectura* published by Fra Giocondo (c.1445-c.1525) in Venice in 1511**

American David Wilkinson invented machinery for the mass production of threaded metal screws.

In fact, it was the screw lathe that allowed for the manufacture of all kinds of parts for everything vital to the industrial revolution, including the all important steam engine.

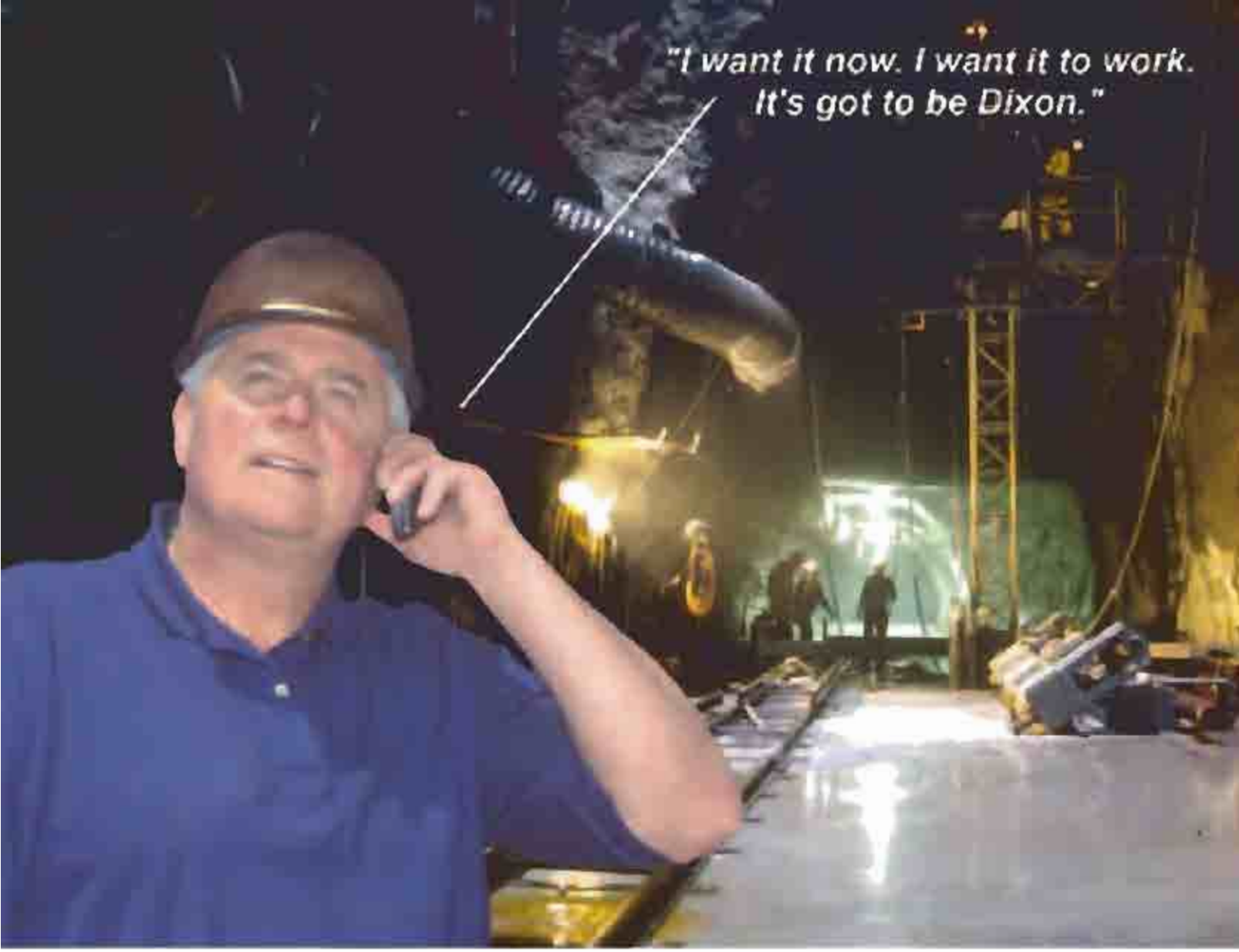
The screw also had another key role in industrial history. While today, according to the National Institute of Standards and Technology, there are close to 800,000 global standards, there were none just a century and a half ago. That was, until 1864, when a man named William Sellers initiated the first successful standardization fight in history, over—you guessed it—the screw. Sellers unveiled a new screw design that was easy to reproduce because of its thread, which was cut on 60-degree angle and had a flat apex.

The next major innovation in screws came in the 1930s, when Henry F. Phillips developed the Phillips screw. Its unique recessed cross slot was designed specifically for use with the automated screwdrivers used in auto assembly lines. What do-it-yourselfers may view as a design flaw—the Phillips' tendency to "cam out," or slip, was actually a desired feature that prevented the automated screwdrivers from over torquing.

In recent years, the square drive screw, first patented in 1908—before the Phillips design—has regained popularity with the advent of power drivers with adjustable torque settings. The square design is said to have better torque than the Phillips and does not pop out when used with torque setting, because the screwdriver disengages when a preset level of resistance is reached.

Today, although easily overlooked, screws are found in everything from microscopes and telescopes to computers and action figures. However, in some parts of the world, people still rely on hydraulic screw pumps for basic functions like transporting water.

Manufacturers continue to refine the screw to make it easier to use and more durable.




DIXON

The Right Connection®

www.dixonvalve.com

# No, nothing else is as good as Dixon.

Choosing something less than Dixon products usually comes with hidden costs. Whatever you gain in price you can lose in quality, reliability, and service.

When you choose Dixon, the difference is obvious: A company with a well deserved reputation for uncompromising quality and excellence. Immediate deliveries. The expertise to answer questions about the right product for the right application.

Make sure you ask for Dixon products by name. When it's got to be right, it's got to be Dixon.

**Dixon Valve & Coupling Company, Inc.**

800 High Street, Chestertown, MD 21620 USA
877.963.4966 • 410.778.2000 • Fax 410.778.4762


WHAT CAN BROWN DO FOR YOU?®

Other companies may offer ground shipping. But only UPS® guarantees day-definite delivery to every address in the U.S. and Puerto Rico. The fact is, for our 68,000 drivers there's simply nothing more important than getting your package where it needs to be, when it needs to be there. Maybe that's why we see more of the country than most people. And why we deliver more packages on time than anyone else.

**UPS.com/delivers 1-800-PICK-UPS®**