

In the chilly early spring of 1889, two dozen sunburned and wiry mine workers in western Colorado started moving the San Miguel River, damming portions of the waterway and sending it into a new wooden flume, a narrow chute used to channel water. Some 80 million gallons of water a day were slated to spray into downstream gravel riverbanks flecked with gold. Carried out by the Montrose Placer Mining Company, the three-year project was supposed to sluice out enough metal to pay for itself. Instead, its \$170,000 price tag quickly bankrupted Montrose Placer. No company records have survived to explain how the workers on sandstone cliffs managed to drill and hammer and cantilever beams and planks for some 16 kilometers.

Flume fragments still cling to the canyon walls along ten of the original kilometers. In some spots, just a couple of iron pins are poked into the rock. But wherever the flume was tucked under cliff overhangs that kept early twentieth-century locals from salvaging much lumber, the brackets and floorboards hang on.

The structure made Colorado's 1999 list of most endangered places and WMF's 2006 list of *100 Most Endangered Sites*. Though rickety and decaying, it has at last begun attracting conservators' attention. It's also being documented down to its bolts and washers.

2006 WATCH SITE

Flume

WITH A VIEW

SAVING AN AMERICAN ENGINEERING MARVEL

by EVE M. KAHN

Archaeologists, wood scientists, engineers, and photographers have rappelled, crawled, sketched, and tapped their way along much of the now-dry suspended chute. Wood, stone, and metal samples have undergone microscopic scrutiny. Reports totaling hundreds of pages have been issued, and plans for stabilization and even partial reconstruction are in the works.

"Flume fever," the experts on the project call their state of mind. When they're in midair analyzing the ruins, says Helena Meryman, an engineer formerly with Robert Silman Associates in Manhattan, "the artifacts are so fascinating, and the scenery so spectacular, you forget to be scared."

The specialists keep mulling over the data collected so far, because so many mysteries about the flume have yet to be solved. "We know what was built, but we don't yet know how," explains Ronald W. Anthony, a wood scientist with Anthony & Associates in Fort Collins, CO. "Isolated men using hand tools, 15 or 30 meters in the air over a river, putting up eight linear meters of flume a day—how exactly was that possible?"

What's certain, based on courthouse and state records and a few vintage newspaper and magazine articles, is that in 1887, Montrose Placer bought thousands of acres of gold claims near the Utah border. (The Ute tribe had been thrown off the land, their own former reservation, by 1881.) Hand-panning for gold—which glaciers there



PHOTOGRAPHY BY JON REIS

had ground to powder—wouldn't have been efficient. So Montrose Placer followed the example of mining companies in California, where some 10,000 kilometers of flume once held river water.

Called hydraulic mining, the process “basically liquefies a hillside and runs it through a sluice,” says engineer Kent Diebolt, founder of the Ithaca, New York-based firm Vertical Access, which dangled staff investigators from ropes along the Colorado flume in 2004. Water flowing through a flume, which is so effective in blasting apart a mother lode, places such stresses on the structure that most don't last very long. In fact, none are left in California, although Ron Anthony has spotted some crumbling brackets attached to Table Mountain, in the northeast corner of the state.

Montrose Placer optimistically commissioned a roofless meter-deep channel of Ponderosa pine upstream from its gold claims. A dam of boulders and cabled-together logs was stretched across the San Miguel. From there the flume makes tight turns through narrow canyons, following a giant wobbly “L” that starts out southwest and then bends northwest. Who engineered this feat?

Reference books in the 1890s would have offered few ideas for flume design. The company did have, however, an imaginative and possibly slippery manager named Captain Nathaniel P. Turner. He was “rumored to have been an experienced miner from California,” writes Jack E. Pfertsh of Alpine Archaeological Consultants in a cul-

ENGINEERS AND CLIMBERS DESCEND TO INSPECT REMNANTS OF THE FLUME.



tural resources inventory for the flume. “It is not certain where Turner was actually from,” the report continues. “He was listed in three different court documents as being from Denver, CO; Sumner County, TN; and St. Louis, MO.”

Colorado journalists in the 1890s nonetheless seemed to find Turner irresistible. In May 1891 he stopped for an interview with the *Grand Junction News*, which uncritically printed his rosy view of the flume: “Everything looks promising for a speedy and profitable return to the company.” A few months later the paper called the nearly finished hanging channel “a magnificent piece of work.”

Turner’s workers had carved dozens of new wagon trails through the scrub to haul 550,000 meters of freshly milled lumber to the riverbed. Half a dozen forges were set up on the cliff tops to heat and shape the wrought-iron anchor rods. As the flume builders progressed downstream to the gold, for unknown reasons, they put up skimpier and skimpier framework.

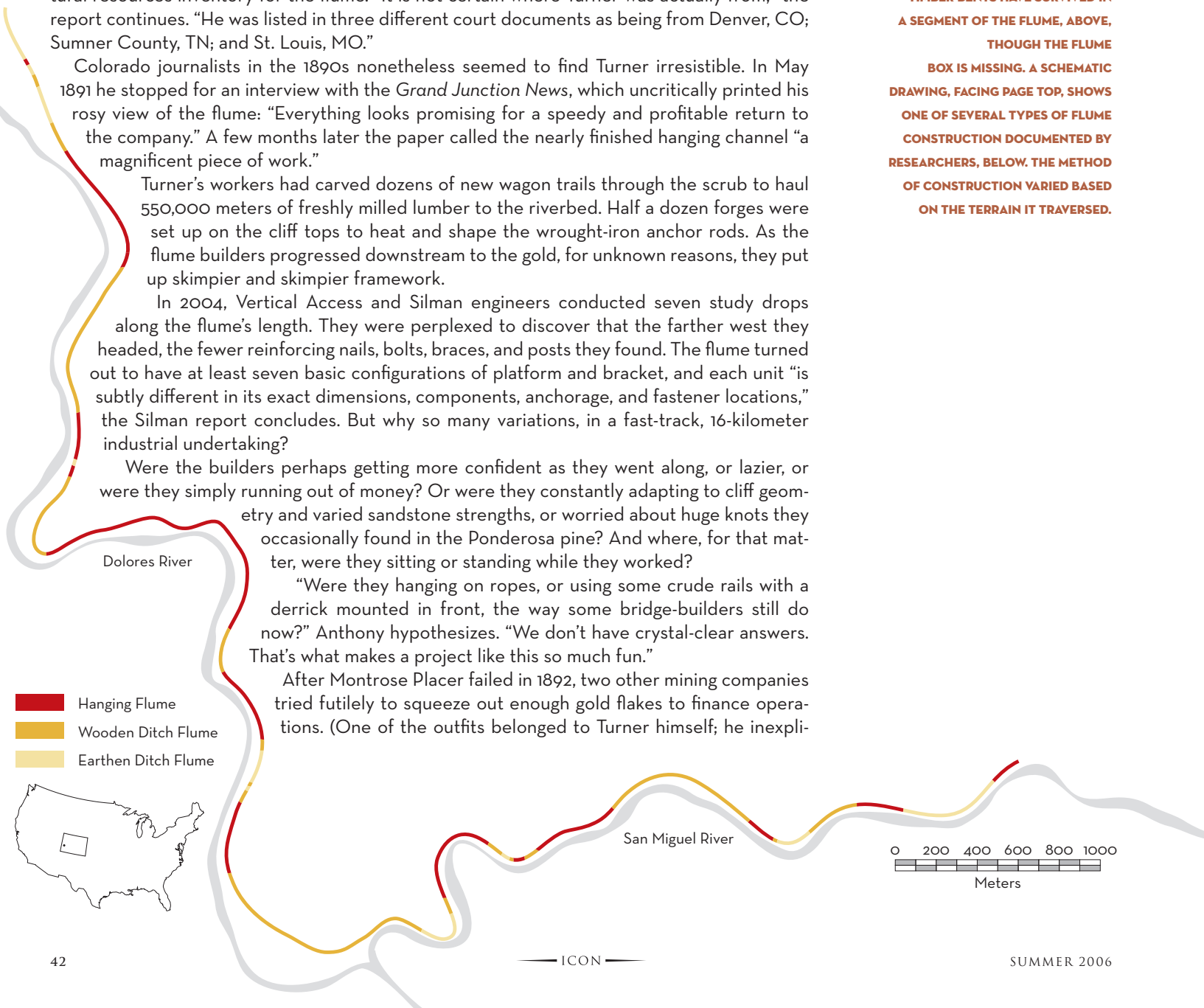
In 2004, Vertical Access and Silman engineers conducted seven study drops along the flume’s length. They were perplexed to discover that the farther west they headed, the fewer reinforcing nails, bolts, braces, and posts they found. The flume turned out to have at least seven basic configurations of platform and bracket, and each unit “is subtly different in its exact dimensions, components, anchorage, and fastener locations,” the Silman report concludes. But why so many variations, in a fast-track, 16-kilometer industrial undertaking?

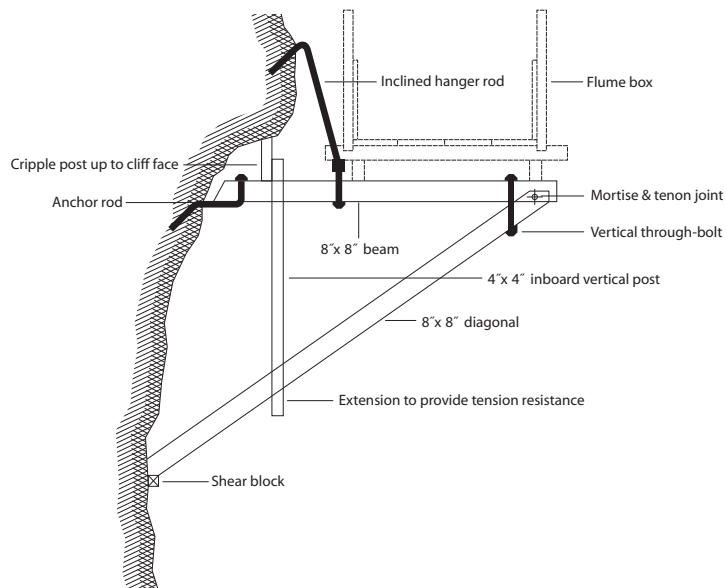
Were the builders perhaps getting more confident as they went along, or lazier, or were they simply running out of money? Or were they constantly adapting to cliff geometry and varied sandstone strengths, or worried about huge knots they occasionally found in the Ponderosa pine? And where, for that matter, were they sitting or standing while they worked?

“Were they hanging on ropes, or using some crude rails with a derrick mounted in front, the way some bridge-builders still do now?” Anthony hypothesizes. “We don’t have crystal-clear answers. That’s what makes a project like this so much fun.”

After Montrose Placer failed in 1892, two other mining companies tried futilely to squeeze out enough gold flakes to finance operations. (One of the outfits belonged to Turner himself; he inexpli-

TIMBER BENTS HAVE SURVIVED IN A SEGMENT OF THE FLUME, ABOVE, THOUGH THE FLUME BOX IS MISSING. A SCHEMATIC DRAWING, FACING PAGE TOP, SHOWS ONE OF SEVERAL TYPES OF FLUME CONSTRUCTION DOCUMENTED BY RESEARCHERS, BELOW. THE METHOD OF CONSTRUCTION VARIED BASED ON THE TERRAIN IT TRAVERSED.





cably gave it the none-too-reassuring name Vixen.) In 1912, uranium and vanadium miners started trying to strike it rich along the San Miguel. A new state highway erased the entrances to Turner’s wagon trails. The U.S. Vanadium Corp. founded a bustling company town named Uravan near the vanished diversion dam. Miners and ranchers propped up their tunnels and outbuildings with timbers yanked or sawn off the flume. The flume has no surviving walls, not even in the most inaccessible niches. But thanks to the dry climate, according to Anthony’s findings, most of the remaining support timbers aren’t rotten but rather slowly weathering, shrinking by a centimeter per century.

Due to high levels of radiation as well as the presence of heavy metals such as lead, arsenic, cadmium, and vanadium in tailings and groundwater, Uravan was shuttered and declared a Superfund site in 1986. Almost all the buildings, where 800 people lived in the town’s mid-century heyday, were deemed contaminated and razed. According to the Environmental Protection Agency, cleanup of the site will be completed this year. The settlement closest to the flume now is Naturita, population 635, 25 kilometers away. The state highway has been designated part of the Unaweep/Tabeguache Scenic and Historic Byway, and one turnoff bears a signpost encouraging drivers to peer down at the flume. Kayakers, canoers, fishermen, and mountain bikers also come to marvel at the spindly relic. So do amateur preservation activists, most famously Jerald Reid, a retired machinist in Whitewater, CO, and a flume-fever sufferer for 15 years.

“I’ve hiked every accessible inch of the flume, I’ve rappelled along the cliffs, and I’ve taken eye-level video of it from a powered parachute going 70 kilometers an hour,” Reid says. The site is remote and forbidding, but nonetheless publicly accessible; it mostly belongs to the Bureau of Land Management (BLM). A few privately held sections are farmland or abandoned mines. Reid collects historical images of the flume, lectures frequently on the topic and helped get it listed on Colorado’s 1999 endangered-places registry. “He got people across the state to recognize that the flume is much more than some sticks on a rock,” Anthony says. Pfertsh has examined 23 sites associated with the flume, including construction camps and forges; Reid led the archaeologists to all but two of those troves. Along one trail was found a bosun’s chair: a rope-hung plank swing, which the flume builders probably used. Complete with fragments of original rope, it’s been donated to a museum in Dolores for protection from looters—or, as Pfertsh’s report dryly puts it, “to prevent its loss by unauthorized collection.”

Funding for scholarly flume studies, about \$150,000 to date, has come from a dozen donors including the BLM, the National Trust for Historic Preservation, and Colorado’s State Historical Fund. Another \$180,000 (mainly from the BLM and Historical Fund) has been allotted for 2006 to fund plans for proper signage, a fly-through DVD flume tour from the Western Colorado Interpretive Association, and specs to reconstruct a short section perched on old beams for tourists to visit. “We have made great strides in raising awareness of this unique site, yet, the flume is still far from being out of danger,” says Anthony, noting that funds have yet to be found to document the most remote stretches of the engineering marvel or to preserve even a short section, much less build a reconstruction for visitors. ■