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Excavations 800 meters deep

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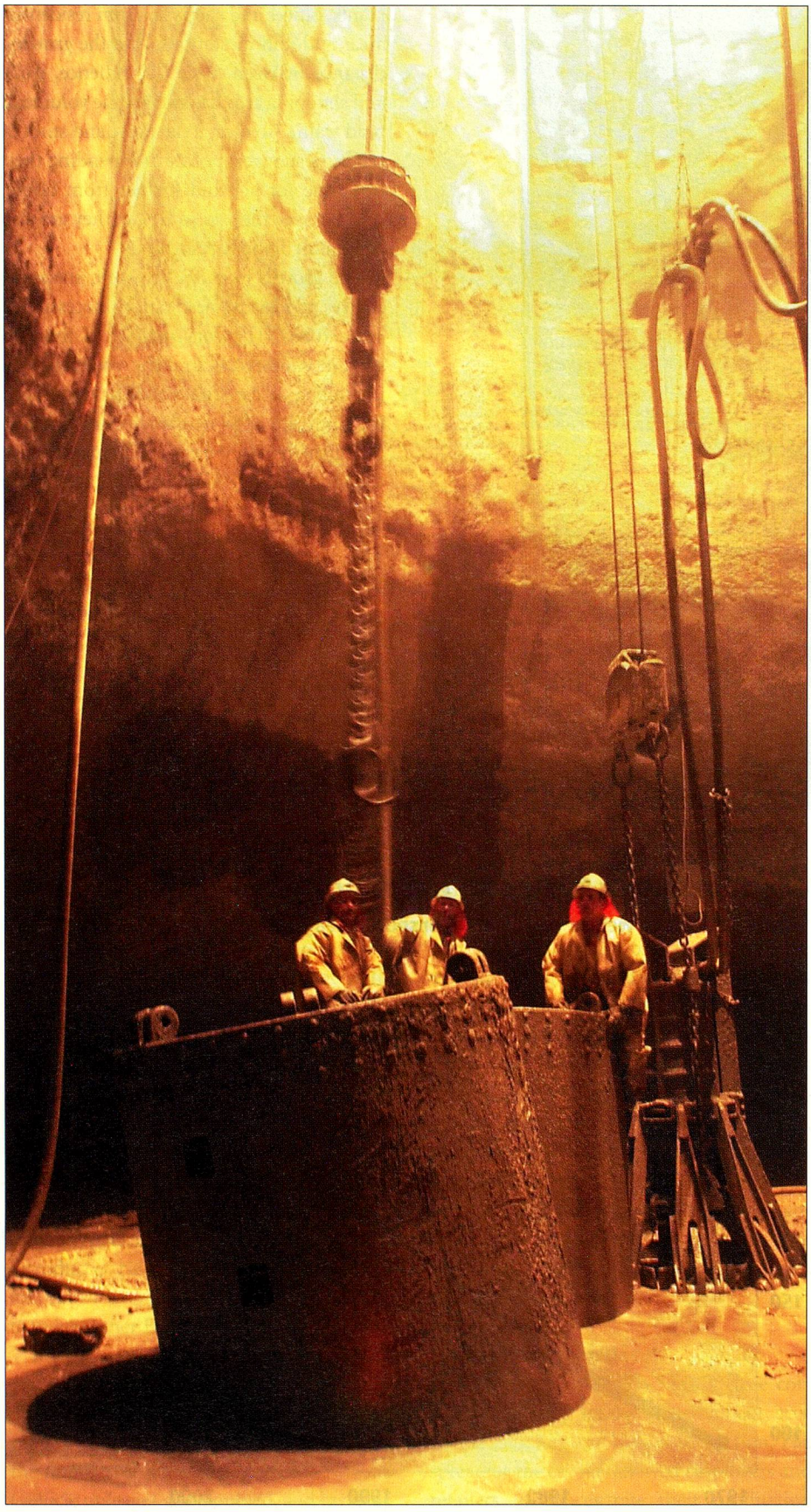
The sleepy appearance of the picturesque Grisons community of Sedrun hides a hive of activity. Deep inside the surrounding rockfaces, work on the Gotthard Tunnel is in full swing.

THE SEDRUN SHAFT represents one of the key elements in implementation of the Gotthard base tunnel, which on completion will be the world's longest rail tunnel at 57 kilometers. Besides enhancing passenger transport – the travelling times between Italian-speaking and German-speaking Switzerland will be cut by almost an hour – the future base tunnel will also enable the shift of goods traffic from road to rail.

Even if the tunnel entrances and exits are in the Ticino and Uri, the most important construction sites of the alpine transit project are located in the canton of Grisons. Thanks to the Sedrun shaft, construction of the Gotthard base tunnel has been shortened by at least five years. According to current estimates, the project should be completed in 2012.

Tricky terrain

The Sedrun site is regarded as the most technically difficult tunnel section. Some of the rock strata in the Tavetsch central massif (particularly slate, brittle gneiss and loamy kakirites) does not exactly lend itself to



Photos: Markus Senn

The Gotthard base tunnel is a construction dominated by superlatives: at its completed length of 57 kilometers, it will be the longest railway tunnel ever constructed.

tunnel construction. Consequently, special equipment and techniques need to be deployed. But despite difficult conditions the project organisers are confident that work will proceed more or less according to plan, even if they are currently slightly behind schedule.

At the entrance the excavators have penetrated over 800 meters into the core. The work is coordinated from the main shaft. After the main shaft was excavated, the tunnel level was reached on 1 March this year. Since then boring has been in progress to open up three large holes at the level of the future base tunnel. This work is scheduled for completion in late 2001.

Teamwork is a must for underground construction.

Gigantic ant-heap

The Sedrun construction site resembles a huge ant-heap. What at first sight appears to be a simple mound of earth is, in fact, a veritable nerve centre for the wide range of activities being carried out by industrious workers. And every person knows exactly what task they have to perform. A look into the mountain's interior gives one the impression that Sedrun is connected to the outside world by a one-kilometer-long rabbit warren large enough to drive a bus through. In the so-called main shaft (14 meters high, 90 meters long and 21 meters wide), excavation is in progress and appears to be disturbing the quiet of Sedrun not in the slightest. This is the first time a vertical shaft of this size has been bored in Switzerland. The technique involves conventional drilling, blasting, and debris clearance.

Working in 8-hour shifts, the 150-strong excavation team changes the face of the interior daily. The construction site is run by a consortium of five companies: four Swiss (Murer, Zschokke Locher, Marti Tunnelbau, CSC Costruzioni) and one South African (Shaft Sinkers International). The South Africans have the requisite know-how to sink the deep vertical shaft, and are managing the work at this crucial phase of the project.

The tunnel level is at least 800 meters lower than Sedrun. Every day the excavators head down to do more drilling, returning again with huge volumes of earth. Grippers and windlasses are used for the shaft work as well as for debris removal and personnel transportation. They consist of large containers measuring five meters in diameter and over two meters in height, which are moved with the aid of huge cables.

Speedy descent

Once the South African "sinkmaster" has given the green light, the gripper descends at a rate of nine meters per second. The shaft is virtually always closed and is opened only for a short time to allow the gripper to ascend or descend. If even a single stone were loosed in the shaft, it would have the impact of a deadly projectile at a drop of 800 meters.

The bottom is reached after a 90-second trip. This is the level of the future base tunnel. Power generators and water jets absorb the noise. The working conditions are harsh, but the excavators carry out the special techniques in a routine manner. Water drops incessantly from above and collects in large volumes on the ground, mixed with concrete and sprays of iron chips at the walls.

At this level a surreal atmosphere prevails. While the excavators work using gestures reminiscent of a ballerina, the engineers carefully measure the pressure in the hole.

To prevent influxes of water from the rock mass, the rocks are sealed with an injection of cement ("shotcrete") before being lifted out. After blasting, the excavated area is anchored with a mixture of ferroconcrete and iron chips. Excavation will continue until the end of next year, after which ground will be broken for the three holes at the level of the future base tunnel.

Following installation of the necessary technical apparatus, excavations will begin in the northern (1.8 kilometers) and southern (4.6 kilometers) direction in the autumn of 2002 to construct the base tunnel. In the absence of any problems, the excavators of Sedrun will meet and shake hands with their colleagues in the Amsteg (UR) and Faido (TI) shafts in approximately six or seven years.