A Multiple Disk Glass Cutter

FOR more than four thousand years there was no other means of cutting glass than with the diamond, and it was usually done with the chip diamond. It was, however, very effective, but it remained for an American to invent the little wheel or disk approaching the hardness of the diamond and taking its place for doing this work.

Among the several types of wheel glass cutters manufactured, one of the most unique is a multiple disk cutter with a turret head containing six wheels. These small wheels or cutters are placed around the periphery of a larger disk which is pivoted on one side of the holder. One wheel after the other may be brought into the position for cutting by simply turning the turret head by loosening and tightening a screw.

In order to prevent the cutting edges of the disk from becoming rusty, a disk of absorbent material is placed on one side of the turret head in such a manner that it continually rubs against the upper edge of the disk which is in the cutting position. This absorbent material is filled with oil which keeps the wheels clean and free from rust.

Lessons of the Disaster of the "L. II."

By Carl Dienstbach

THE most advanced of all dirigibles, the giant Zeppelin "L. II.," completed for the German navy, has shared the fate of one of the crudest early attempts at airship construction—Severo's "Pax." In other words, the "L. II." exploded and burnt in the air and everybody on board was killed. One man, in spite of terrible burns, survived the fall (of 900 feet) for several hours.

No general conclusions can be drawn from this latest and most terrible disaster sustained by a gas-inflated ship. Nor is the conclusion justified that gasless aeroplanes are safer. If a comparison is made between dirigible and flying machine on the basis of safety, every hour spent in an inflated dirigible must be counted against only the actual flying time of aeroplanes. On that basis the comparison will be in favor of the dirigible. Aeronauts are not afraid to ascend in a spherical balloon filled with inflammable gas. Statistics covering a century and a quarter have shown how slight is the danger of explosion if reasonable precautions are taken. When Severo's airship caught fire, a commission of French engineers decided that it was due to confined spaces within the structure, where a stagnant mixture of air and gas might collect like so much gunpowder. That explosive mixture, once ignited, is worse than so much dynamite. To the ignition of such a mixture the accidents to the old Severo and the latest Zeppelin are due. Gas alone is as harmless as so much flour. An official rule was laid down at the time of the Severo inquiry that no design with such confined spaces should be tolerated. This rule was easily observed by the old, slow "full rigged" ships, with the car hanging far below, and a goodly draft of air automatically sweeping the intervening space.

Curiously enough, it seems to have been progress in attaining staunchness and speed, that eventually brought about a design that embodied the very defect that caused the destruction of Severo's dirigible and made it possible for an explosive mixture to accumulate in enormous quantities.

Close proximity of motors and gas bags is highly desirable and even necessary in a very fast and strong dirigible. However flimsy the fabric may seem, it is just as efficient in keeping the gas out of harm's way as the plates of a gasometer. The fabric of a Zeppelin cannot be torn unless the frame and the netting which strengthen it break first. It cannot retain the gas indefinitely. Still, so little filters through, that a candle can be burned three inches from an inflated balloon, as long as the gas remains at constant temperature and pressure. Gas never becomes dangerous unless it expands from heat or lowered air pressure, and, overflowing the balloon through the safety valve, is not in-

Multiple disk glass cutter. The insert shows the turret head and its wheels in two positions.

stantly diluted with enough air to make the mixture non-combustible.

Confined spaces within the structure of an airship are harmless as long as they are swept by a blast strong enough sufficiently to dilute any amount of gas which may there collect.

The "L. II." had literally a tunnel running within the hull. Within that tunnel gas leaking from the balloons in many compartments could accumulate and mingle with air. She should have had a blower to drive out the hydrogen that had leaked out, or at least to dilute it with an enormous quantity of air. Indeed, she needed

A mine rescue telephone equipment. The transmitter is strapped against the throat so that the rescuer talks, not with his mouth, but with his neck.

a blower as badly as a coal mine. "Gas" might be expected every time the ship rose or was exposed to the sun.

A blower would not detract much power from propulsion, because it is not needed while the ship is under full headway. The ordinary ventilators of a steamer become very efficient when they are applied to a speeding dirigible, because the latter gets the wind strongly always from the same quarter—dead ahead. While the airship is at rest, the motors, instead of running empty, should drive a safety-fan. Any confined

spaces must in addition be sealed against overflowing gas, simply by providing each gas valve with a short gas-tight funnel, through which the gas is carried outside of the hull, into a diluting airblast which must be furnished by blowers while the ship is at rest.

There seems no doubt that in designing and building the "L. II." "internal safety" was overlooked and attention concentrated on strength of construction, so that storms could be weathered.

A Mine Rescue Telephone Equipment

THE development of practical telephone equipment for mine rescue work to supplement the oxygen apparatus now in almost universal use marks a great step forward in providing ways and means for preventing the great loss of life which, in years past, followed every mine disaster. The great value of the oxygen helmet, which permits its wearer to enter a mine and remain in the presence of smoke and poisonous gases for hours at a time without danger of being overcome, has been evidenced by the hundreds of lives which have been saved through its agency. The iron box mine telephone has also proven to be of inestimable service in protecting lives and property. In fact, the laws of a number of States in which mining operations are conducted, include statutes making compulsory the use of telephones underground.

There has been lacking, however, until very recently, a means for keeping the advance or rescue party in the mine in constant communication with the rear party at the entrance of the mine. The need of this was advanced by the United States Government Bureau of Mines, as well as some of the large mining interests. As a result it is now possible to obtain a light serviceable and simple telephone equipment which will meet all the requirements of this unusually severe class of service.

One of the first difficulties encountered in the development of the telephone equipment for the helmet man was to devise a transmitter which would not interfere with breathing. With the oxygen helmets and other types of breathing apparatus in use for rescue work, the mouth is covered in such a way as to prevent its use for talking. This led to the design of a transmitter which is fastened to the throat by means of a pigskin harness and transmits speech on the principle that the vibrations of the vocal cords are transmitted through the throat walls and will in turn act upon the diaphragm of the transmitter. It is essential that the transmitter be held firmly against the skin, and for this purpose a soft rubber cup, which will conform to the curves of the throat, is provided where the mouthpiece would ordinarily be placed. It has been found by laboratory tests and tests made at the Bureau of Mines in Pittsburgh that the throat transmitter will transmit speech practically as well as the ordinary telephone.

Attached to the same harness with the transmitter is a water-case receiver equipped with a leather head band to clamp it firmly to the ear. The head harness, with its receiver and transmitter, is so constructed that it will not interfere with the operation of any of the various types of oxygen apparatus on the market. The head equipment, furthermore, is extremely light and does not in any way inconvenience its wearer.

The telephone apparatus used by the directing party at the outside of the mine is a standard switchboard set consisting of a chest type transmitter and head band receiver.

A "Safety-First" Lesson.—In a recent publication by the Pennsylvania Railroad, whose object is to promote "safety-first" principles among its employees, we note two illustrations, each showing a man seated on the wooden shield covering a third rail, and engaged in some repairs or inspection of a freight car. In the first view, entitled "The Wrong Way," the man is seated directly upon the third rail structure. In the second illustration a large rubber blanket has been thrown over the rail to protect the man's body or his tools from causing a short circuit.

The Zeppelin airship "L. II.," which exploded and burned in mid-air, killing twenty-eight men.