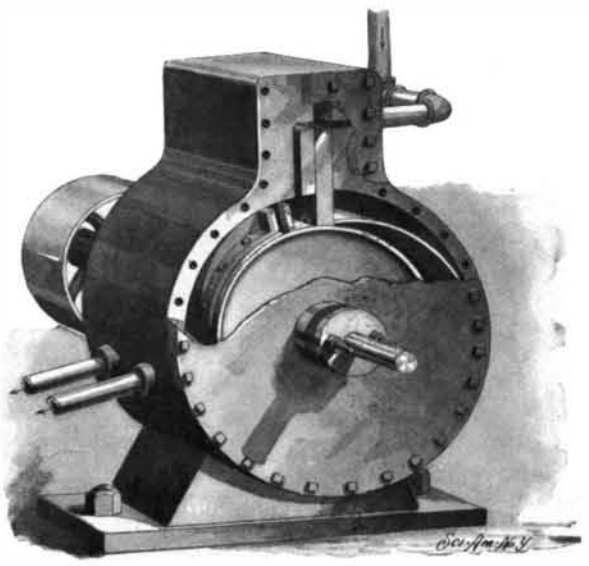
AN IMPROVED ROTARY ENGINE.

The engine shown in the illustration is designed to work with a minimum of friction, has but few parts, and is not liable to get out of order. It has been patented by Gutie H. Tuttle, of Montgomery, Ala., and William W. Buford, of Donaldsonville, La. The engine comprises two cylinders in one casing, the cylinders being separated by a central web, and the shaft carrying two wheels or disks, each occupying one of the cylinders. To opposite sides of each wheel or disk are attached two abutments, each having in its face a packing strip to make steam-tight contact with the periphery of the cylinder, and each abutment has on

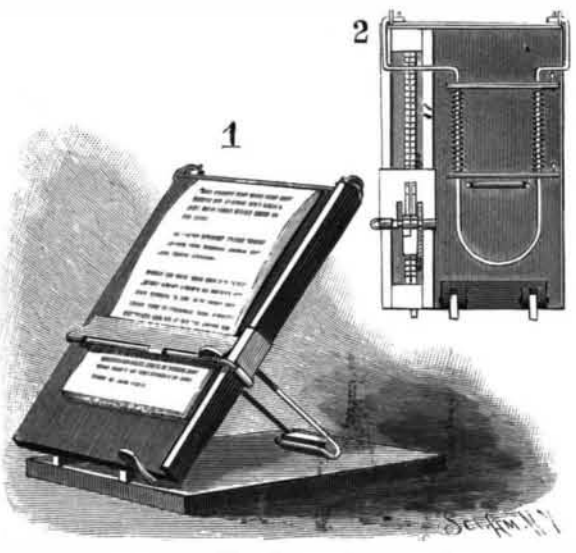


TUTTLE AND BUFORD'S ROTARY ENGINE.

one side a cam or incline adapted to engage and move a sliding abutment or plate, the opposite end of which has movement across the supply port. One end of a flat spring is secured to the lower end of the sliding abutment by means of dovetail tongues, the spring being adapted to lie in a recess in the periphery of the cylinder, and its opposite end being secured in position by screws. The spring extends from the sliding abutment in a direction opposite the direction of rotation of the wheel or disk on the shaft, the cam or incline on the wheel pressing the spring into the recess as the abutment or sliding plate is moved across the supply port, and the spring moving the sliding plate down to admit steam behind the piston head as soon as the latter has passed. The steam pipe delivering steam to the engine is forked into two branches, so as to deliver steam to each side of the engine. The exhaust port is placed at an angle of about ninety degrees from the steam port, and the two piston heads of each wheel being attached at an angle of about ninety degrees on opposite sides, alternate with each other to bring one of the piston heads into use at all times. The spring plate is so proportioned that the pressure of the movable abutment on the wheel will be very slight, thus avoiding undue friction.

A MANUSCRIPT HOLDER AND SPACER.

A device more especially designed for the use of typewriters, to securely hold the manuscript in place and permit of readily turning its pages, while properly indicating the lines of writing as the copying proceeds, is shown in the accompanying illustration, and has been patented by Albert N. Woodruff, of the United States



WOODRUFF'S MANUSCRIPT HOLDER.

Engineer Corps, Willets Point, New York Harbor. Fig. 1 represents the device in use, Fig. 2 being a back plan view partly in section. The manuscript support is hinged at its lower end to a suitable base, and is held in inclined position by a brace, which may be disconnected to fold the support down upon the base. The manuscript is held at its upper end by a clamping bar extending along the top edge of the support, this bar being hung in the ends of a frame which slides in bearings on the back of the support, the frame being pressed on by springs to hold the clamping bar down on manuscript or a book. The lower end of the frame has a handle, by taking hold of which the clamping bar is lifted to permit the removal of the book or manuscript, or, when a page of manuscript has been copied, it may be swung to the rear over the clamping bar. The spacing or line plate is mounted on a rod secured to a slide movable in a guideway at one side of the manuscript support, a spring pressing on the plate to hold it in firm contact with the outer page of the manuscript. The slide extends to the rear of the support, where it carries spring-pressed pawls in mesh with two rack bars, one fixed to the back of the support, while the other slides in bearings, and has at its lower end a finger piece projecting to the front lower edge of the table. By pressing upon this finger piece, when the device is in use, the sliding rear rack bar with its pawl is carried downward, together with the slide and the spacing or line plate, the entire downward movement being the distance between two lines on the manuscript or copy. It only requires a slight pressure on the finger piece to enable the operator to shift the spacing plate as desired.

THE AVEN ARMAND, LOZERE, FRANCE.

BY HORACE C. HOVEY.

In southern France is a region, once an unbroken plain, but now cut by erosion into a number of dry, barren, treeless uplands by deep and picturesque canyons. This is known as the Land of the Causses, a word derived from the Latin calx, through the Provençal caous. These independent plateaus rise to a height of from 1,000 to 4,000 feet above the level of the sea, and the gorges between them are correspondingly deep. There are few running streams along their surfaces; but the rainfall is swallowed by "avens," or pits, like the sink holes of Kentucky, to reappear in gushing springs, that are gathered into rivers clear as crystal, whose cliffs tower to a tremendous height, and display as rich a variety of colors as may be seen in the Grand Canyon of the Colorado.

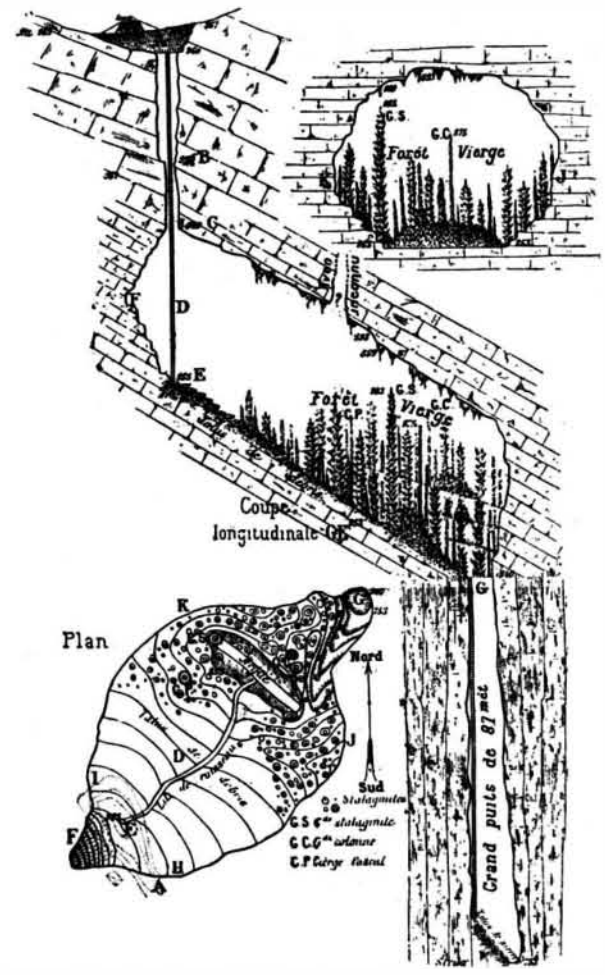
Last September, in company with a party of cave hunters, we went by rail to the quaint old city of Mende, where we took carriages across the Causse, Sauve-Terre, by a magnificent road built at the expense of the province of Lozére. The descent to the hamlet of St. Enimie was by a zigzag series of terraces, leading down from the lofty plateau to the banks of the turbulent river Tarn. Here our party took canoes manned by expert boatmen, shooting some of the rapids, and making portages around others, with occasional pauses to examine venerable castles or interesting grottoes, till, after an exciting voyage of about forty miles, we came to the junction of the Tarn and the Jonté, and made our headquarters at the lovely village of Rozier, whence we made various excursions, only one of which is now to be described, namely, that to the Aven Armand, a singular and terrible pit in the Causse Méjean.

Only four of our party undertook this somewhat perilous exploration, namely, Messrs. Martel, Viré, Armand and myself. We ascended the charming valley of the Jonté to a point almost opposite the celebrated cavern of Dargilan, where we left the state road for a rough and narrow wagon track that wound tediously up the lofty plateau. In doing this we passed many objects of interest. There were tall cliffs, from 500 to 1,000 feet in height, huge monoliths standing like so many obelisks, and majestic archways carved from the purple or vermilion limestone. We saw a number of inhabited cliff dwellings; and saw one that was altogether new, located on the edge of a precipice as abrupt and underneath a crag as inaccessible as those of the similar cliff dwellings of Arizona, but with a winding sheep path leading down to it through a chasm. Geologically speaking, the lower cliffs are of dolomite, above which is a sloping talus of oolitic marl, then another thick mass of Bajocian dolomite, surmounted by thin layers of Oxford limestone, rising like rude stairways to the plateau, where lie broad sheep pastures, with here and there bits of arable land. The only inhabitants are simple peasants, dwelling in moss-grown stone huts, winning a scanty living from their flocks and oat fields.

On the farm of Mr. Bertrand lies an ancient burying ground, the scattered tombs being huge heaps of limestone slabs. One of them we opened, finding human bones and prehistoric implements. In the distance gleamed the Cevennes Mountains, already white with snow, although it was only the 20th of September. Amid the rude dolmens yawned the blackest, ugliest pit that ever entrapped stray animals or unlucky human beings, or that ever tempted reckless cave hunters to fathom its awful depths.

Mr. E. A. Martel, the renowned speleologist, was our leader, and his outfit was complete. It included an ample tent, numerous rope ladders of the most approved pattern and of extra lengths, a folding canvas boat for sailing on subterranean waters, should any be found, a coil of copper wire for our telephone, tools of all kinds needed, together with a fair supply of provisions. No wonder that the peasants took it for the outfit of a traveling circus.

The first thing done was to pitch our tent near the brink of the aven. The next was to gather a quantity of the wild boxwood that grew amid the dolmens, and make a fire by which to warm ourselves and cook our dinner. Preparations followed for descending the aven. Four stout crowbars were fixed firmly in the

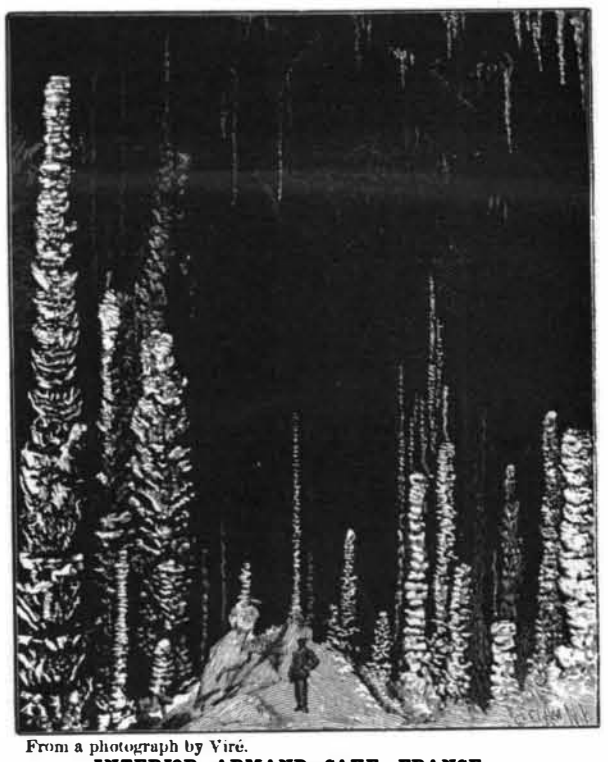


G, C, large column; G, S, large stalagmite; G, P, altar candle; E, bed of cave brook.

THE ARMAND CAVE.

seams of the limestone ledges. The pit was measured and found to be exactly 240 feet in vertical depth. A rope ladder of the required length was fastened to the bars and then hurled down the pit. The copper telephone wire was uncoiled and stretched back from the aven ready for use. It was decided that Mr. Louis Armand was to have the honor of making the first descent, having been the man to call attention to the locality; and it was afterward agreed to give the aven his name, calling it the "Aven Armand," and we are informed that he has since bought the place, with the intention of making it accessible to the traveling public.

Before setting his foot on the first round of the swaying ladder, Mr. Armand fastened a rope around his waist, the end being held by stout peasants. Another rope, held in a similar manner, was attached to a cross bar, on which the explorer sat. These precautions



From a photograph by Viré.

INTERIOR ARMAND CAVE, FRANCE.

were deemed necessary in case some one rope should be cut on the edge of a projecting rock or for some other reason give way. Armand took along a supply of candles and of magnesium ribbon. He carried a pocket telephone, such as is used in the French army, the other end of it being left in the tent. For some time his orders were shouted back long after he had disappeared from sight. But at length his sole reliance was the telephone. It seemed an age before the news was whispered up from the heart of the earth that he had