lamps is furnishing the amperes necessary to light 100 lamps. The voltage required for one lamp is the same as required for 100 lamps if the lamps are in multiple, as lamps are ordinarily arranged on a 100-volt circuit. If the lights were arc lights in series, then the amperes would be the same for 100 as for one lamp, and the volts would vary from lamp to lamp. One lamp would require about 50 volts, and 100 would require 5,000 volts. It is, however, not usual to put more than 50 lamps in series upon 2,500 volts.

(10292) J. F. M. asks: I would like to know if the small dynamo can be run as a motor on a 110-volt circuit, and what changes in winding would have to make for that purpose. A. The small dynamo of SUPPLEMENT No. 161 cannot be run on a 110-volt circuit. It would burn out directly. We have not the winding data for changing this dynamo to 110 volts. You will find such a machine described in Poole's "Designs of Small Dynamos," which we send for $2.

(10293) E. L. W. asks: Will you kindly state in your Notes and Queries column what causes the report made by the cracking of a whip? A. The crack of a whip communicates a shock to the air which is transmitted to the ear, and we hear the sharp, sudden sound.

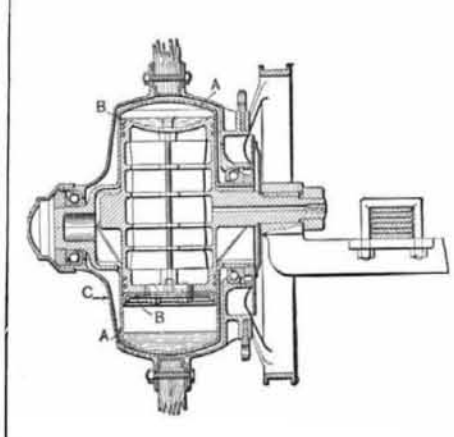
(10294) G. L. S. asks: Will you kindly tell me if I hold a strong horseshoe magnet near a copper wire, say within a half inch, and then pass a powerful current of electricity through the copper wire, will there be any attraction between the wire and the magnet? If I make the magnet stationary, and then hold the wire very close to it, and slack enough for it to readily reach the magnet when the current is sent through it, would they move toward each other, or would there be no change of position at all? If they do attract each other, how strong a magnet, also how strong a current, will be needed to pull this wire say a distance of an inch or a little less? A. If a coil of wire carrying a current of electricity is brought near a powerful magnet, one end of coil will be attracted toward the magnet and the other end will be repelled from it. This is because the coil is itself a magnet and behaves as a magnet does. A straight wire will be very slightly affected by even a powerful magnet. It will be twisted around till its field of force lies with the lines parallel and in the same direction as that of the magnet. It will then move toward the magnet, but not with much force. The energy of a single wire is not great enough to cause it to do so.

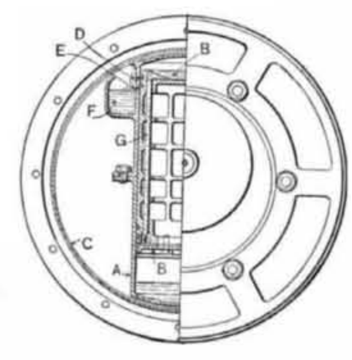
(10295) G. O. V. asks: Will you please let me know what century or year, and where, the Romans first made the day to begin at 12 o'clock and end the next night at 12 o'clock? A minister told me some time ago that he guessed they did it in the fourth century. I want to know sure. A. We think you have been incorrectly advised as to the practice of the Romans in beginning the day at midnight. They did not begin to do this in the fourth century, since they seem always to have begun the day at the middle of the night. Varro, a learned Roman of the time of Cicero, wrote a book which has not come down to us, but which has been quoted by several authors whose works we have. The title of the book was "Concerning Human Affairs." One of the chapters was upon "Days." This chapter is quoted in the "Saturnalia" of Macrobius, Book I., Chap. 3, as also by Gellius in his "Attic Nights": "Men who are born in the 24 hours from midnight to the next midnight are said to have been born upon the same day." By which words it is evident, Macrobius says, "that they divided the observation of the day so that he who was born after sunset and before midnight, that should be his birthday in which that night begins; on the contrary, he who was born in the six later hours of the night should be considered to be born on that day which followed that night." And this, so far as the authorities go, was always the practice of the Romans. The Babylonians reckoned from sunrise to sunrise (Isodorus, "Orig." V. 30), while the Athenians and the Hebrews reckoned from sunset to sunset (Gellius, "Attic Nights," III., 2.) "The same Varro in the same book has written," says Gellius, "the Athenians observe differently, in that they say that all the time intervening from one sunset to the succeeding sunset is one day."

PNEUMATIC STEEL HUB FOR AUTOMOBILE WHEELS.

While the pneumatic tire admirably performs its function of absorbing obstructions and inequalities of a roadbed when these are small, it falls far short in the case of large obstacles and deep ruts and holes. The novel construction illustrated herewith is offered as a remedy for this deficiency. In order to relieve the tire which, as shown by incessant tire troubles, is entirely too delicate a member to be subjected to such rough treatment as it ordinarily receives, an auxiliary cushion is provided at the center of the wheel to take up heavy shocks. This air cushion, which is in the form of a column of air, is placed between the wheel and the axle, so large obstacles can be overriden without lifting the car body. The new construction has been subjected to a thorough test during the last year on a double-chain stock machine weighing about 3,000 pounds with its full complement of five passengers. The wheels, which are of the usual artillery type, 36 inches in diameter, are fitted with solid tires.

The construction of the wheel may be readily understood by reference to the accompanying sectional views. It will be observed that it consists of three essential parts. A vertically-disposed double cylinder, *A*, mounted in ball bearings on the wheel, a hollow piston, *B*, operating within the cylinder and formed integral with the axle, and a hollow hub, *C*, entirely enveloping the piston and cylinder. The car is provided with a small air compressor driven by the engine, which delivers air under pressure to a reservoir or tank provided with a safety





valve controlled from the dashboard. The air from this tank is delivered through a central bore in the axle to the hollow piston. Between the top of the piston and the upper end of the cylinder, an air cushion is provided, which is utilized to produce a forced circulation of oil to the moving parts.

In operation, when an obstruction is encountered by the wheel, the latter is raised, compressing the air between the bottom of the piston and the lower end of the cylinder, while at the top air is drawn through a row of ports, *D*, in the cylinder, and oil is sucked in through a lower row of ports, *E*, from the reservoir, *F*. This oil flows into the concave top of the piston, lubricating the piston rings and guides. On the rebound of the wheel the oil trapped is forced down a tube, *G*, to the lower end of the piston. It escapes past the piston rings, lubricating the latter, and through ports in the lower end of the cylinder drips into the hollow hub. As the latter is rapidly revolving, the oil is carried upward, as shown in Fig. 2, and dashed against the upper end of the cylinder, whence it falls into the oil reservoir, *F*. Thus a complete cycle is established. It is claimed the loss of air and wear of the parts is very small. This wheel is particularly adapted for use on such cars as use compressed air.

A NOVEL REFLECTOR.

The accompanying illustration represents in longitudinal section the Gray-Davis acetylene lamp for automobiles. In order to obtain a light which will answer the dual purpose of being visible at a great distance and which will, at the same time, brightly illuminate the road ahead of the car, a novel arrangement of a concave mirror and convex lens has been adopted. It will be seen that the

(Continued on page 43.)