Guns on Aeroplanes

By John Jay Ide

AT the last Aeronautic Salon in Paris were shown several aeroplanes equipped with Hotchkiss quick firing guns. In almost every case, however, the firing arc was extremely limited owing to interference by parts of the aeroplane. Exception may be made in favor of the gun mounted on the Borel monoplane, which had its bow clear owing to the rear position of the propeller. Here again, however, there was an objection in that the gun had to be operated by the pilot, the passenger being placed behind.

The invention of M. Loiseau seems to solve the difficulty of fitting guns to present day monoplanes. As shown by the accompanying photograph, the arrangement consists in attaching the gun to a support braced to the mast and fuselage. The support is high enough to enable the gun to fire over the tractor even with considerable depression. The marksman is protected in front with a shield of four-millimeter armor, and has a light railing at the sides and rear. Granting the efficacy of the shield, the position of the passenger is an extremely exposed one. Also the pilot's view is somewhat interfered with notwithstanding the small sections cut out of the trailing edges of the wings adjacent to the fuselage, which allow him to see the ground. On the whole, however, the gun placing is the most satisfactory possible in tractor screw monoplanes.

The mitrailleuse is fitted to a military type two-seated Deperdussin. Trials commenced February 10th at Villacoublay, near Paris, under the control of Capt. Destouches of the French army. The pilot, Prévost, took up a mechanic to act as marksman. On February 14th the trials were renewed, this time under the observation of Gen. Bernard, Col. Estienne, and several other army officers of high rank. The passenger-marksman was the inventor, M. Loiseau. He operated the gun while the monoplane was on the ground, in full flight and gliding. The accuracy of the shooting while in the air was not remarkable, but it is a mere matter of time before that is obtained. The practicability of operating a gun in this position was fully proved.

The aerial marksman in action.

A Self-steering Farm Motor

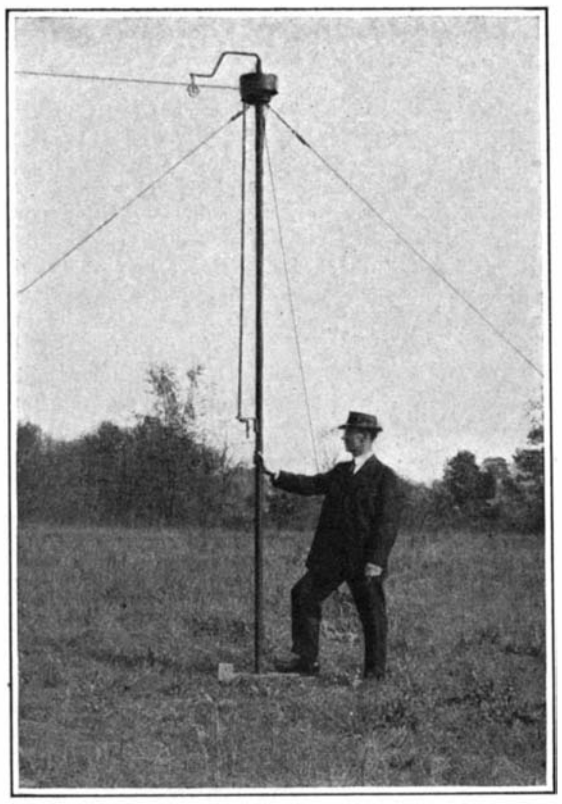
By Herbert I. Washburn

THE application of the gasoline motor to agricultural work is of great interest to inventors at the present time. A solution of the question has been obtained for the big farms of the West in the form of the gasoline tractor, but this does not meet the requirements of the irrigated truck farms and gardens of the Eastern and Southern States.

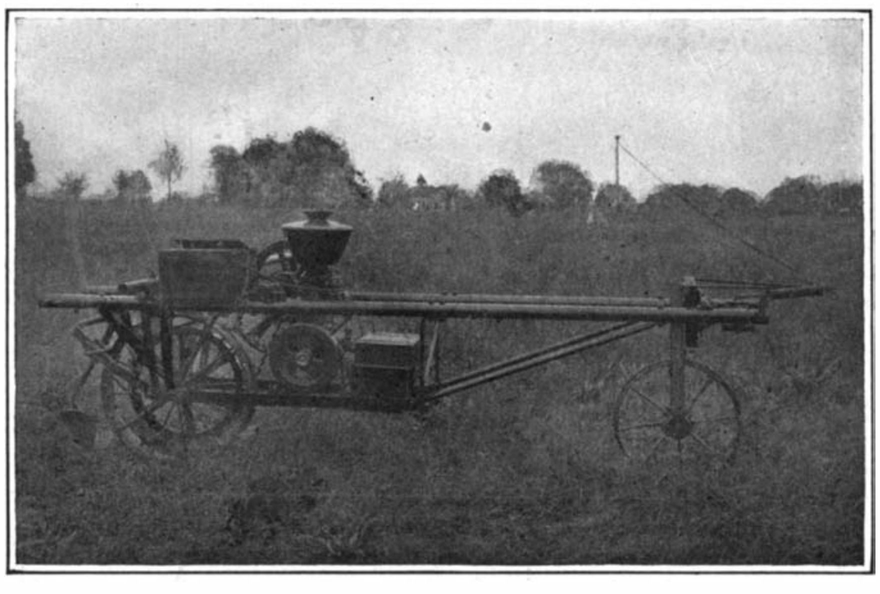
The great need of the country is an efficient helper for the owner of the one-man farm; a machine that will work effectively and make him less dependent upon hired help. No hand steered machine can meet this requirement because the expense of the operator takes $500 per year off the profit of the farm. This was unavoidable with the use of the horse as motive power, but as the gasoline motor is an automatic power source, its correct use requires automatic steering.

Here is a system which has been worked on a practical basis by the writer. It requires compliance with certain mechanical conditions. The farmer who wishes to make use of it must be willing to abandon the old traditions of extensive farming. He must be willing, if necessary, to sell the hillside farm inherited from his grandfather and lay out a new farm to meet those conditions. This is an easy matter with young men just taking up intensive farming, and with those migrating to new localities.

The farm must contain one or more circular areas of any size, up to about ten acres each in area, reasonably level, and irrigated preferably by the tile system. Thus, a farm in central Florida would consist of the usual ten-acre square, with a seven-acre circle in its center, the remaining corners, three acres in area, being occupied by fruit trees, buildings, etc. In the center of the seven-acre circle, the center post shown in the accompanying photograph would be permanently installed. At the top of this post, which is strongly guyed, is seen an iron drum. This drum is indexed and locked by the small handle on the side of the standard. Attached to the iron drum is a slender steel wire, tempered and tin coated. This wire passes through the guide pulley shown, and then to the steering lever of the implement some distance away. At each revolution of the implement around the field, the wire wraps once around the drum, hence the circumference of the drum determines the swath of the implement. Between the frame and the steering lever of the implement a strong spring is attached tending to steer the implement away from the center post. The steering wheel has a deep flange in order to resist side pressure and is mounted in a ball-bearing head. About two pounds pressure at the end of the steering lever is sufficient to guide the implement. Since the tension of the steel spring (and of the steering wire opposing it) is about fifty pounds, the steering lever is obliged to follow an exact spiral path.



Center post about which the tractor runs.



Gasoline tractor that runs a spiral course without an attendant.

Repeated runs with the experimental implement shown in the accompanying photograph, starting at a radius of about 200 feet and finishing about 20 feet from the center post, showed no visible variation from the path first struck out. A plow jointer was used to indicate this path. A door check was made use of to prevent any undue vibration of the steering lever. The slight dancing of the steering wire was desirable, as it obliterated the last vestige of friction in the steering head.

The framework of the implement is intended to be such as will facilitate the attachment of all the devices used in row-crop farming, such as plows, ridgers, cultivators, sprayers, etc. Also conveniences for use in connection with hand steering, such as mowing bar, carrying rack, etc.

An improved style of implement has been designed having motive power applied to both rear and forward wheels, both wheels being pivoted so as to work between closely set rows of plants. About 90 per cent of the weight of the machine is on the two drivers, giving a strong adhesion. The remaining 10 per cent weight is on the wheel at the end of the beam. The height under the beam is about three feet, permitting the cultivation of truck, tobacco, cotton, etc., of that height. A safety device is provided to stop ignition in case of breakage of the steering spring or wire.

The steering action of the tractor was found to be very dependable in the experimental runs, requiring no attention whatever. The unwinding of the wire from the drum is accomplished while the implement is being run out of the field by hand steering. The steering wire is then suspended ready for use at the next operation. With a dependable gasoline motor, having a positive lubrication, etc., two six-hour runs per day, without an attendant, are possible, placing the farmer on an equal footing with the manufacturer, with his automatically-fed, power-driven machines.

Fodder Equivalents

COMPARATIVE tables of the nutritive value of various foods, and the proportions of proteids, fats, and carbohydrates they contain, have long been available for students of human dietetics. That similar tables would be equally valuable to breeders of domestic animals is obvious. According to *La Revue* (Paris) such tables are now furnished by Prof. Mallevie, who holds the chair of zootechnology in the National Agronomic Institute of France.

"For the first time we are in possession of fodder equivalents. We now have a precise knowledge of the value to horses or cattle of definite quantities of hay, straw, clover, flax-seed cake, and beets, in what measure they can be substituted for each other to attain the same result and what economy or other advantage may result from such substitution."

M. Mallevie shows that 6 pounds of meadow hay give the same alimentary result as 12 pounds of wheat-straw, 2¾ pounds of wheat bran, 22 pounds of beets, 5½ pounds of clover hay, or ½ pound of flax-seed cake. "These figures indicate what he calls the unit of fodder. His table shows how, in default of one equivalent, another may be used without inconvenience, quantities being combined according to circumstances."

Breeders will thus be enabled to compute profits more definitely, and can find by experiment what food gives the largest returns in meat, milk, butter, etc. With reference to its cost, it should be remembered, however, that two animals fed on the same ration may vary in power of assimilation, so that one will extract better results per kilo than the other.

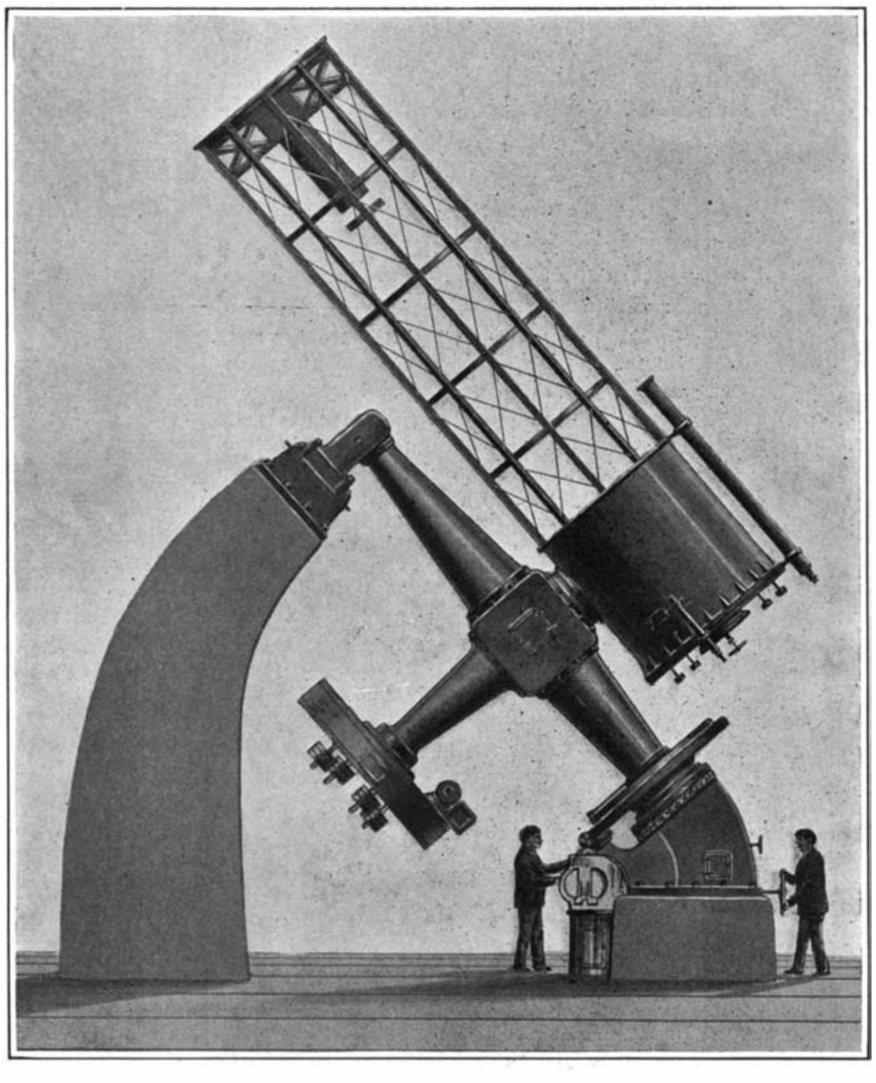
Duplicating Charts by Zincography.—The United States Hydrographic Office has recently installed a plant for the reproduction of foreign charts by zincography. The hydrographer states in his last annual report that this work will occupy at least four years, but when it is completed the Navy will be practically independent of foreign sources of supply for charts.

A Great Telescope for Canada

THE Canadian government will soon possess a more powerful reflecting telescope than any now in existence. It has been referred to in the newspapers as "the largest telescope in the world," but this description is misleading for two reasons; first, because its aperture, 72 inches, is to be the same as that of the famous Parsonstown reflector, built by Lord Rosse in 1842; and second, because by the time the Canadian instrument is completed it now seems likely that the 100-inch reflector which has long been under construction for the Mount Wilson Solar Observatory will also be ready for use. The Canadian telescope will, however, be a much more efficient instrument than Lord Rosse's. Not only will the mirror be much superior, but the mounting will enable the telescope to be worked to the full advantage. The Parsonstown reflector has an altazimuth, not an equatorial, mounting, and is operated under such difficulties that comparatively little use has ever been made of it.

Contracts for the new telescope have just been awarded to J. Brashear for the mirrors and other optical parts, and to Warner & Swasey for the mounting. The disk for the principal mirror will be made by the St. Gobain glass works, in Paris, but all the grinding and figuring will be done in this country. The total cost will be nearly $100,000. Inasmuch as the instrument is intended primarily and notoriously for work of no immediate practical benefit, viz., the spectrographic measurement of radial stellar velocities, this sum represents a very notable contribution to pure science on the part of a government.

The telescope will have a parabolic mirror of 72 inches clear aperture and 30 feet focal length, with a central hole 10 inches in diameter. The mounting is to be similar to that of the Ann Arbor and Melbourne reflectors, with a skeleton tube at one side and nearly midway between the bearings of the long polar axis, the balance being restored by the declination motion mechanism and by counterweights at the other side. Both polar and declination axes will be carried entirely on ball or roller bearings, in place of the usual plain bearings for collimating and a complicated system of counterweighted rollers for relieving the friction. The construction will also be simplified in other respects, e. g., all fine circles will be omitted, as will the slow motion arm in right ascension. It is characteristic of twentieth century technique in astronomy that, although the new telescope will have a full set of oculars for visual observations, no programme of visual work is contemplated. Nowadays the camera takes the place of the human retina. The main purpose of the instrument will be the measurement of motion in the line of sight of stars fainter than the fifth magnitude; a task beyond the light-gathering power of nearly all existing telescopes. For such work the telescope will generally be used in the Cassegrain form; the light from the main mirror, converging toward a focus, will be received by a second hyperboloidal mirror of about 19 inches aperture and 10 feet focus, placed about 23 feet above the main mirror. The light passes thence down through the hole in the main mirror, and the star images are formed about three feet below the latter. Here the spectrograph will be placed. For the fainter stars of low dispersion the spectrograph will probably be placed at the prime focus. An investigation of the atmospheric conditions in different parts of Canada is now in progress, to determine where the telescope will be located.



Powerful reflecting telescope of the Canadian government. 30 feet focal length.

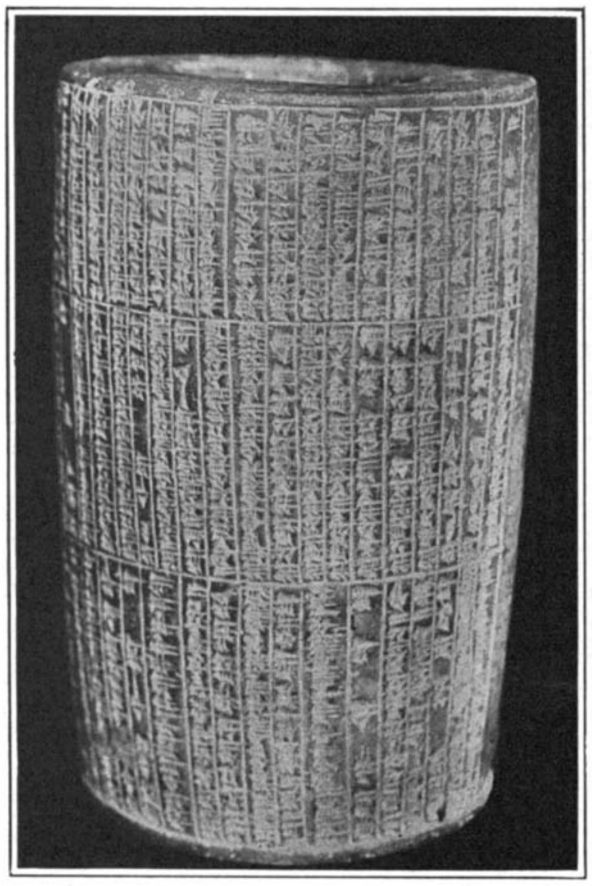
The main purpose of the instrument will be the measurement of motion in the line of sight of stars fainter than the fifth magnitude.

Nebuchadnezzar as a Builder

By Edgar J. Banks

PROBABLY the greatest builder the world ever had was Nebuchadnezzar, King of Babylon from 604 to 561 B. C. There is hardly a ruin in Babylonia which does not show traces of his work. Nearly everywhere in Mesopotamia, and even in Persia, are found bricks bearing his name. He delighted in restoring the old temples. He surrounded defenseless cities with walls and moats. He confined the rivers to their courses with huge brick embankments. Shortly before his time Babylon was completely destroyed, and its foundations were scraped into the river, but he rebuilt and enlarged the city. The temples with which he adorned it amazed even the travelers from distant Greece. The walls surrounding it were one of the seven wonders of the ancient world. Fortunately it was Nebuchadnezzar's custom, whenever he built or restored a temple, to write a long description of his building operations upon a cylinder of clay, and to bury the record in the walls that future generations might read of his work. His wish has been fulfilled, for during the past two years several of the cylinders have been discovered by Arabs, and have found their way to Europe and America.

One of the last of the cylinders to appear, and now in the possession of the author, was discovered by Arabs in a ruin called Wana-Sedoum, or more correctly Wannet es-Sa'dun, a day's journey to the south of Babylon on the Euphrates River. It mentions the ancient name of the place as Marad, and thus another city is added to the map of ancient Babylonia. The cylinder is really a truncated cone, 8½ inches high and 18 inches in its greatest circumference. It is of finely molded clay thrown upon a potter's wheel, and built up as if it were a vase without a bottom. The interior walls distinctly show the finger marks of the ancient potter. The walls are very thick. After the cylinder was inscribed, it was burned until the clay resembled a compact sand-colored stone. The inscription is in three columns, with 145 lines of cuneiform writing, and so well has it been preserved that every one of the fifteen hundred or so of wedge groups is perfect.



A finely molded burned clay cylinder of the great builder, Nebuchadnezzar.

The inscription is in three columns, with 145 lines of cuneiform writing, and so well preserved that every one of the fifteen hundred wedge groups is perfect.

The first part of the inscription is familiar because it is practically a duplicate of the records upon similar cylinders discovered elsewhere. Nebuchadnezzar begins in his boastful way by telling who and how great he is. Then follows an account of the building of the great walls of Babylon "mountain high," and of the restoration of several temples in Babylon and other Babylonian cities, including the Biblical cities of Ur, Larsa, and Erech, and of the tower at Borsippa, which travelers have called the tower of Babel. His account of how the gods instructed him to make a charm against disease, and to bury it in the foundation of the temple, hints at the superstition of his time. His prayer to the goddess Ninharrak shows his piety and command of beautiful language.

The last part of the inscription is of historical importance, for it is new. In it he speaks of restoring the temple at Marad, and ends with a prayer to Lugal-Marad, the local deity of the place. A translation of the inscription is as follows:

"I am Nebuchadnezzar, King of Babylon, the great, the mighty, the favorite of Marduk, the powerful prince, the beloved of Nabu, the ruler who knows not weariness, the protector of the temples Esagil and Ezida, who is obedient to Nabu and Marduk his lords, who does their bidding; the wise Lord, the darling and the joy of the heart of the great gods, the first-born son of Nabopolassar, King of Babylon.

"When Marduk, the great lord, made me the rightful son, to rule the land, to be the shepherd of his people, to care for the city, to rebuild the temples, he bestowed upon me his great power. Tremblingly I was obedient to Marduk, my lord. I completed Imgur-Bel and Nimitti-Bel, the great walls of Babylon, his mighty city, the city of his exalted power. At the entrance of the great gates I erected strong bulls of bronze, and terrible serpents standing upright. My father did that which no previous king had done. With mortar and bricks he built two moat walls about the city, and I with mortar and bricks built a third great moat wall, and joined it and united it closely with the moat walls of my father. I laid its foundations deep to the water level; I raised its top mountain high. I constructed a moat wall of burned brick about the west wall of Babylon. My father built the moat walls of the Arahtu canal securely with mortar and brick. He built well the quays along the opposite shore of the Euphrates, but he did not finish all his work. But I, his first born son, the beloved of his heart, built the moat walls of Arahtu with mortar and bricks, and joining them with the moat walls of my father, made them very solid.

"Esagil, the wonderful temple, the palace of heaven and earth, Ekua, the temple of Marduk, the lord of the gods, Ka-hili-sug, the dwelling place of Zarpanit, Ezida, the temple of the king of the gods of heaven and earth, I clothed with shining gold, and made bright like the day.

"Ezida, the favorite temple, beloved of Nabu, I restored in Borsippa. With gold and jewels I made it beautiful like paradise. I overlaid with gold its great beams of cedar, and arranged them by three to cover Emahtila, the shrine of Nabu. I rebuilt and made lofty Emach the temple of Ninharsag, in the center of Babylon. . . .

"I did a thing which no king before me had ever done. To the west of Babylon, at a great distance from the outer wall, I constructed an inclosing wall 4,000 cubits in length about the city. I dug its moat to the water level. I walled up its sides with mortar and burned bricks, and I united it securely with the moat wall of my father. Along its edge I built a great wall of mortar and burned bricks mountain high.

"I rebuilt Tabisupurshu, the wall of Borsippa. To strengthen it, I built the wall of its moat about the city with mortar and burned bricks. In Borsippa I rebuilt the temple to Tur-lil-en, the god who breaks the weapons of my foes. Ebarra, temple of Shamash in Sippar, Eanna, temple of Ishtar in Erech, Ebarra, temple of Shamash in Larsa, Egishshirgal, temple of Sin in Ur, the sacred temples of the great gods, I restored and completed.

"The support of Esagil and Ezida, the rebuilding of Babylon and Borsippa, which

(Concluded on page 318.)