The Electric Gyro-Cruiser

A Rolling Electric Gyroscope Fort of the Near Future. By Eric R. Lyon, A. B.

THE world will have wars for generations yet to come, but the time is near at hand when their destruction of human life must cease. How is this to be? Simply that all future war must be naval warfare, by which we mean there must be a navy for each of the three elements, earth, air and sea. We have our navy on the sea, and we have begun our navy of the air. Who knows but that our last and greatest navy stands now upon the threshold of human ideas, awaiting only a proper invitation for its entrance into our affairs?

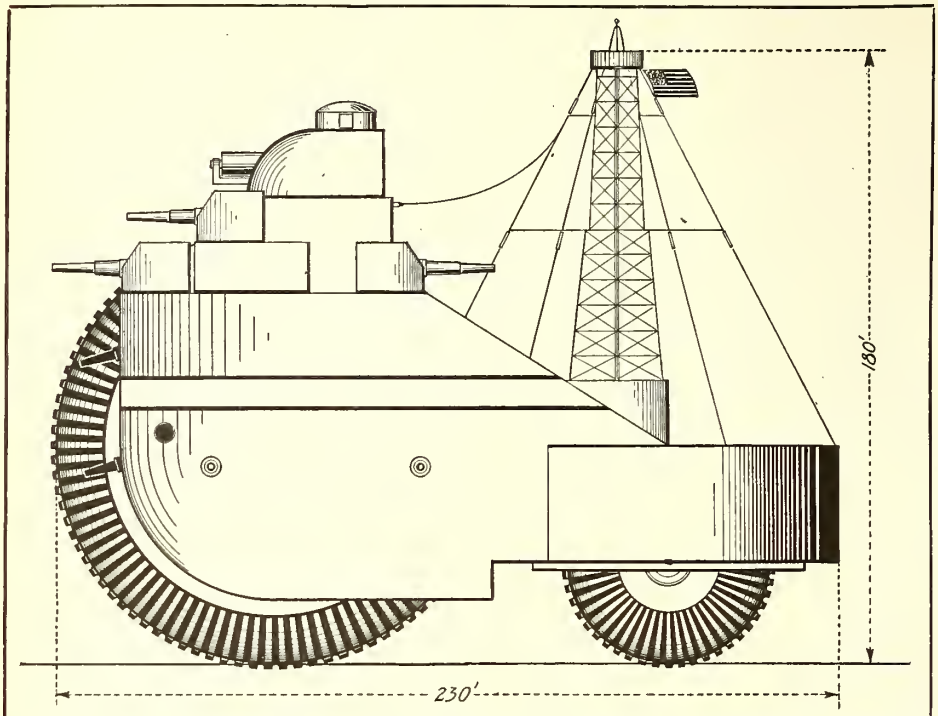

Fig. 1. Side View of Possible Land Cruiser of the Near Future. It Could Smash Any Fort With Its 42-Cm. Guns.

Suppose Great Britain's giant navy could now come up out of the sea into the plains of northern France and, mounting itself upon wheels, dash in single line formation at express train speed upon one single, unsuspecting and strategic point of Germany's hundreds of miles of battle front. What would happen?

We are told that "this is a war of ammunition;" that the decision of this war is practically a question as to which side can ultimately hurl the most tons of shot and shell into the trenches of his opponents. Now we know that if you and I and Smith and Jones and all of our neighbors are strung out over a hundred miles of battle front it is going to take an enormous amount of shelling to shell us out. But if the enemy should suddenly concentrate all of his fire upon Jones' pasture, or even upon 15 miles of battle front adjoining the pasture, there is not going to be one man left alive in all of that harnel ground to prevent the enemy breaking through. This, in brief, is the tactics of the present war. The enemy does break through. His infantry runs, his cavalry gallops and his big guns creep; all trying to get through the gap in our lines. In the meantime the warning has gone out broadcast to all of us. We rush in our reserves, and move up our own big guns to defend the breach. We storm the field. We mow down his necessarily massed ranks as with a reaping machine. We convert that 15 mile breach into a veritable inferno of hail, wind and destruction; or steel, fire and blood. The enemy is forced to retire; that is, all of him left to retire. We close up the breach, dig in again and await the next assault. This also is the tactics of the present war. Our infantry can move as rapidly as the enemy's infantry; our cavalry can gallop as hard as his cavalry, and our big guns can creep as slowly as his big guns. Consequently we were there in force before he could break through far enough to do him good. The net result of the whole encounter is another blood sacrifice to the war demon, and another call for ammunition on both sides.

Transferring ourselves from Jones' pasture to a point overlooking that select portion of the German battle front which we before mentioned, we may now imagine what begins to happen as the great British fleet comes in range behind the distant horizon. Our first warning of the impending battle is the increasing rattle of machine guns in the clouds, as the few local scouts of the German aerial fleet flee before the concentrated and overwhelming British aerial navy. Presently down comes a German Taube in flames. The British planes are circling far overhead and are signaling the ranges to the British gunners behind the horizon. The staccato roar of the German anti-aircraft guns has begun There is a distant rumble. The one remaining door of the hut in which we have taken refuge shudders, and immediately 10 or 20 bursts of flame search out the German batteries. In range of this 15 or 20 mile strip the Germans have 11 big howitzers. These are the chief concern of the British gunners. The British aerial fleet signals back the results. In the meantime one Taube scout has succeeded in landing behind the German lines. Ranges and movement of the British land fleet are immediately 'phoned to the German gunners. The big howitzers open fire, but the British aerial fleet, pursuing the Taube scout, had signaled warning to their land fleet when they could not prevent the scout's landing; and so, when the German 42-centimeter shells tear up a certain plot of ground behind the horizon it is from another point behind that ominous line that the first great answering salvo thunders forth. Through the glass we observe a distant German battery go up in flame and twisted steel. The thunderings become incessant and they seem to be coming nearer. Their salvos must be finding the targets. Suddenly the field has become alive with the bursts of six-inch shells seeking out the Germans' lesser batteries. Panic reigns. Through our glass we can see men and cannons dashing madly to new positions away from the bursts of those deadly pursuing shells. Yet not a man can we see going to the rear. The Germans have even in their despair resolved to stand their ground and die before the overwhelming onslaught. But neither do the British shells fall among the massed German infantry reserves, nor in the trenches armed only with machine guns and men helpless in the vortex of

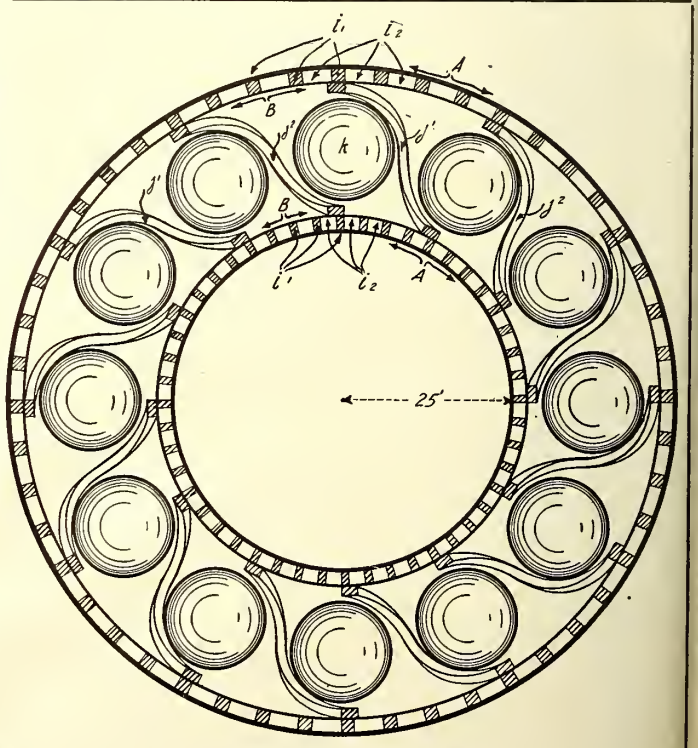

Fig. 3. Sectional View of Massive 2,000-Ton Liquid Gyroscope for Maintaining Equilibrium of Land Cruiser.

this maelstrom, for Britain has not elected to slaughter her enemies, but to overcome and to disarm them.

At last the hail of shell has ceased in the district under our observation and has swept out like a scythe into the far outlying districts. The breach has been made. The British monsters appear upon the horizon thundering, flaming, racing; bearing down upon us at express train speed. Onward they come. Presently one sweeps past into the gap and then another and another.

The memorable raid of the British land fleet had begun. It is recorded—and so it will be when the imagined incident here pictured shall have become a matter of past history—it is recorded that the British land fleet, having broken through the German lines, cut a swath of destruction through to Berlin more effective than even the famous Sherman's march through Georgia, and as they rode they destroyed every means of communication, of transportation; every munitions depot and provision depot; and ending with the destruction of the great Krupp works, there followed the surrender within a few weeks of the whole German army for lack of provisions and munitions. A new epoch was begun.

This is the picture of the possibilities of the new arm of military power. Now let us consider the probable form of its machinery. The form which first suggests itself is, most naturally, an overgrown reproduction of the common four-wheeled truck or wagon, and if such a device were designed to operate only over level ground or over especially prepared roads of about 100 feet in breadth it would be capable of good service and great speed. It would be possible to construct such roads all along the coastal country to be defended, and yet the four-wheeled units would be sadly hampered by their inability to operate away from the ideal conditions so prepared. If a unit of the future land navy, or a land cruiser we may call it, is to be of real service it must be able to maneuver anywhere over any kind of ground except precipices, and it must be able to make express train speed over common country roads and over the fields of gently rolling country. A device of this type is possible only when it shall employ some other means than a broad wheel base to maintain itself upright. Indeed, if the land cruiser is to be operated over country roads the breadth of its wheel base cannot exceed the breadth of the road, some 25 or 50 feet, which fact would necessitate balancing the structure upon not more than two great wheels—bicycle fashion. Going at full speed our huge device would be able to balance itself after the manner of a bicyclist, but it must also be able to maintain itself firm and upright even when standing still. To accomplish this there is one practical means of which we are aware, and that is the gyroscope.

Let us then call our land cruiser a gyro-cruiser. A likeness of what this may be we have in Fig. 1. Gyro-cruisers will begin, of course, very humbly, and at first will be gyro-trucks rather than gyro-cruisers. The conditions of mounting the gyroscope in the gyro-truck; the conditions of mounting the weight of the structure upon its wheels and, in fact, almost all of the conditions governing the small device will be different from those which will be found for the huge machine. So it is not with the steps upon the way, but with the type of the full-grown cruiser, of the gyro-navy in its prime, with which we are now concerned. Such, we may imagine, is the American gyro-cruiser shown in Fig. 1, with its extreme height of 180 feet from ground to top of fire control mast, its extreme length of 230 feet, its maximum breadth or beam of 87 feet and its maximum wheel breadth of 25 feet. The weight will be about 20,000 tons, one-tenth of which, 2,000 tons, will be the weight of the liquid gyroscope carried in the rim of the great wheel. The latter may be seen projecting downward and forward of the main substructure in the diagram, Fig. 1. The gyro-cruiser will mount 12 17-inch guns (or will they by that time have grown to 27 inches?) in six turrets, three of which are shown, the other three being similarly placed on the other side of the superstructure, and will be able to fire a salvo of eight guns in nearly every direction from the cruiser. Instead of the customary arrangement of low caliber guns, as in a battleship, an arrangement which is made necessary by the manner of firing with respect to the roll of the ship, the gyro-cruiser will mount in the 40-foot crown turret shown a huge machine gun, comprised of a rotating cylinder having mounted in it a sufficient number of complete and individually recoiling six-inch rifles, which shall be electrically fired as they successively pass through a predetermined firing position. One man will be able to aim and control the fire of a torrent of six-inch shells, and thus a weapon will be provided which, being peculiarly adapted to the gyro-cruiser, will give the latter added superiority to any other type of military unit operating upon the land. The great wheel shown in Fig. 1 is the traction wheel, and it is 108 feet in diameter from one beveled, cutting-edge foot to the other. The "little" wheel, which is 60 feet in diameter, is the steering wheel, and is also the balancing wheel—a fact which is apparent when we consider that in order for a gyroscope rotating in a vertical plane to exert its balancing power about a horizontal axis, it must be able to swing freely about a vertical axis. The uses of the aerial and fire control mast are obvious.

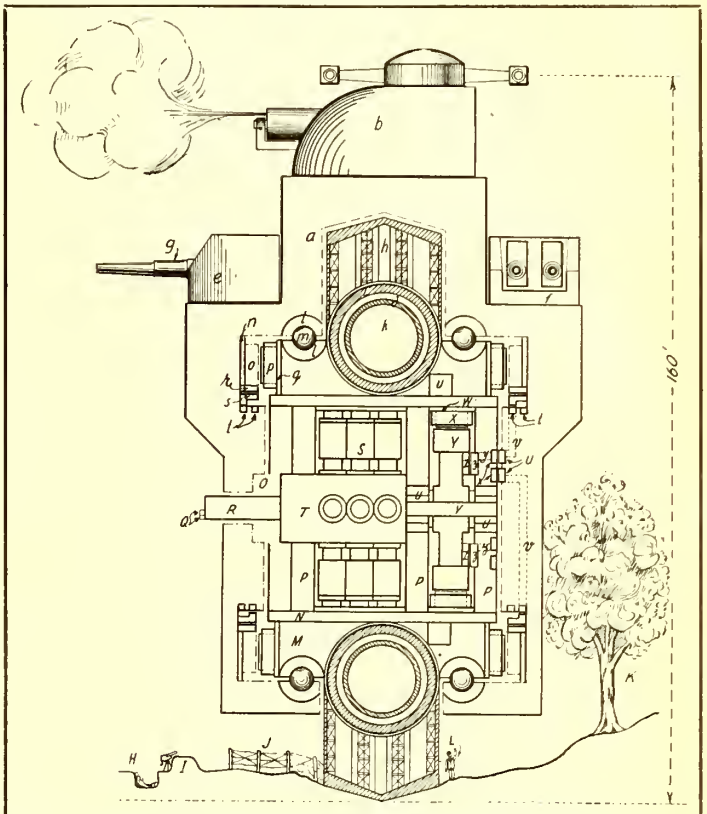

Fig. 2. Front Sectional View of Mastodonic Land Cruiser of the Future. Note Comparative Size of Man Here Shown.

Passing to Fig. 2 we have a detail, vertical cross section cutting the cruiser in a plane passing up through the center of the great wheel. We will follow the latter in explaining this diagram. On top is the crown bridge. It is heavily armored, rotates like a turret and carries the armored range finding arms, the eyes of which are now staring at the reader. Other range finding stations will be located at the top of the first control mast and at various points about the cruiser. It shall be the duty of these stations, not only to obtain the ranges of the enemy's positions, but to maintain an accurate running survey, analogous to the log at sea, from which the exact position and orientation of the cruiser may be told at any time. The complete control of the cruiser will be centered in the crown bridge, but there will be duplicate control stations in the main bridge (a) and at other points. The officer on watch at the crown bridge's range finder will have complete control of the cruiser, and he will electrically train and fire all of the guns, at the same time following the results of his own operations through the huge telescopic range finder.

(b) is the crown turret carrying the six-inch rifle machine gun described; (a) is the main bridge, offices, range plotting rooms, etc. Forward of this, but not shown in any of the diagrams, is the main searchlight station; (e) is a 17-inch gun turret, side view; (f) is the same, but looking into the business end of the guns; (g) is a 17-inch gun; (h) is the bevel-faced and very heavily armored foot or rim of the great wheel.

All inside of the broken line .—.—.—. is part of the great wheel and rotates with it. The armor of (h) is put on in plates parallel to the plane of the wheel, which is to say, perpendicular to the plane of the section. The plates will be welded together, making the rim of the great wheel one solid mass of steel capable of supporting the weight which it must bear and capable of withstanding the enormous centrifugal or bursting effort of the liquid gyroscope—the latter is carried immediately below (h) in (i), (j) and (k).

(i) is a cross section of the lining of alternate magnet coils and iron rings in the tube of the liquid gyroscope; (j) is the space in which is wound the spiral of *non-magnetic* steel which causes the liquid to spiral round the tube in a second rotation impressed upon the primary one; (k) is the hollow propelling ball of iron and steel faced construction, 15 feet in diameter, which floats in the liquid and which is sucked around and around the tube by a rotating magnetic field, just as is the action upon the shell in the proposed electro-magnetic gun: (1) is the section of a ring of heavy welded armor which, like the ar-

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THE TRENCH TRACTOR.

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induce the men to leave their trench, and, secondly, if they persist in remaining they stand a good chance of being bayoneted or otherwise becoming exterminated by their foes. Incidentally the tractor, being enveloped in a cloud of steam, is protected in a certain degree from the enemy's shell fire.

If a dozen or more tractors of this kind were sent against a line of trenches, it is difficult to see how the enemy could hold them.

"So far so good," my wise friends will observe; "but suppose the enemy, too, has Trench Tractors. Suppose that the 12 French Tractors rush against the 12 German ones. What then?"

In answer to this the writer points to the submarine war and its recent collapse. As long as the submarine could not be combated it raised havoc, the same as the Trench Tractor will raise havoc till it can be combated. But the submarine is now combated by the electric submarine "ear," and the battleship—but a few months ago relegated to the scrap heap—has come into its own once more.

So it will be with the tractor. It will make trenches untenable and thus its importance becomes inestimable indeed, for it will put the men in the field, *where they belong*, not in the trench scrap heap. No war can ever be won if the men stay in the trenches. If there had been no trenches the European war would have been over in six months.

THE ELECTRO GYRO-CRUISER.

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mor of (h), serves double purpose as armor and as the bearing seat and guide for a system of huge ball bearings; (m) is a ball bearing five feet in diameter and probably of solid steel; (m) and its fellows roll in the space between (1) and (l).

This system of bearings will be able to carry a weight of thousands of tons at a rotation speed of 60 miles an hour—which would be only 30 miles an hour between the ball and either one of the bearing surfaces—with minimum friction, wear and trouble, and with the maximum reliability of any system which may be devised, even as it is so with more modest types of ball bearings.

(n) is a section of the armature res of the very powerful two-speed electric driving motors. The two multi-polar motors are each about 70 feet in diameter. On low speed they will be able to force the gyro-cruiser over rough country and directly up steep grades, while very steep grades will be overcome by a zigzag ascent. On high speed the twin motors will be able to rotate the great wheel at 15 or 16 revolutions per minute, a rate at which the cruiser will be making 60 miles an hour over the road.

(o) is an armature coil; (p) is a field coil; (q) is the field core; (r) is the commutator; (s) is a brush which plays between the commutator and the slip rings (t).

The brushes are mounted on miniature electric trucks which run upon a circular track laid inside of the commutator, and their velocity of movement over the track, as well as their position at any time, is controlled from the bridge. The significance of this method of control may be seen upon a little reflection.

(t) slip rings mentioned; (u) is the space in which is the commutator controlling the rotating magnetic fields of the liquid gyroscope; (v) feeders running from gen-