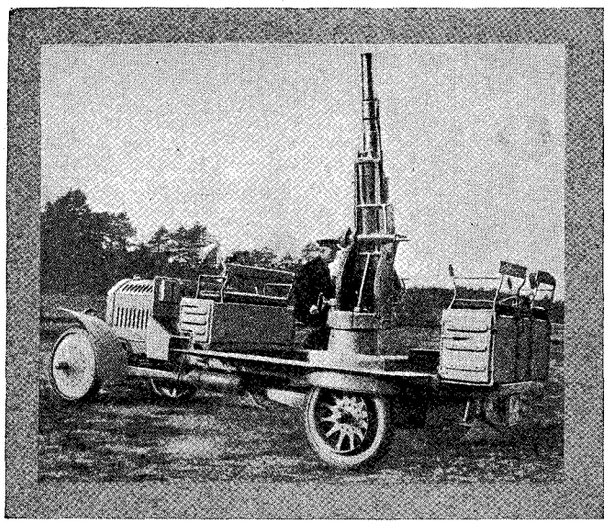
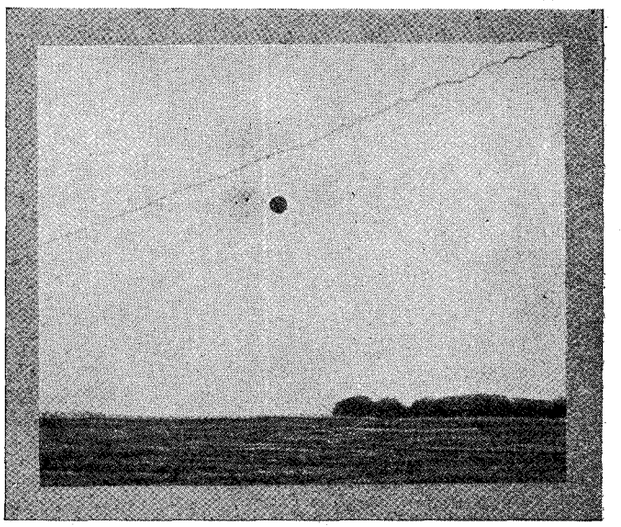


KRUPP GUN WITH MOTOR CARRIAGE FOR BALLOON-FIRE.



SMOKE-TRAIL OF A "FUMIGEN" SHELL FIRED OVER A BALLOON.

TO BRING DOWN HOSTILE SKY-PILOTS.

might have spread over to the rest of the habitable bodies of the universe. . . . A demurrer to this seductive theory was entered by M. Paul Becquerel in a paper read before the meeting of the Paris Académie des Sciences (July 4), in which he points out that the bactericidal effect of the ultraviolet rays from incandescent stars has been neglected by Professor Arrhenius. M. Becquerel recognizes that the combined effect of extreme dryness and of extreme cold considerably increases the powers of resistance to the destructive action of ultraviolet rays, but it does not make them invulnerable. He has exposed spores in a vacuum and under conditions of extreme cold to the action of ultraviolet light, and their life is completely destroyed in a few hours. This destructive action of the ultraviolet light would seem therefore to be universal. But if that is the case, then, seeing that the celestial spaces about our planet are ceaselessly traversed by light which is rich in ultraviolet radiations, there is a very large probability that all spores passing through these dangerous zones would be rapidly destroyed. Interplanetary space is sterilizing and sterilized."

## A STUDY IN COMPARATIVE LAZINESS

THAT THE working force of an average factory, in its productive department, far exceeds the office force of the same establishment in efficiency, is charged by F. W. Brady in an article entitled "The Expense of Non-Producers," published in *The Iron Age* (New York). The productive workers have been trained to make the most of their time and they realize that a strict account is kept of their output, while the clerks in the office keep on with outworn and antiquated methods and are paid regardless of what they accomplish. In short, up-to-date methods are characteristic of the shop, but not of its office. He says:

"In the non-productive branches the majority of employees are salaried and their expense is fixt irrespective of the amount of labor they perform. Their output can not be weighed in avoirdupois and is not susceptible to the radical betterments we find possible in the shop. . . . . .

"It is not uncommon to find in a large industry, in which the shops are being crowded to the limit of capacity, without a space for a breath between operations, more or less of the office force killing time in consequence of a poor subdivision of the work in hand, or a slip in the layout of the day's duties which the executive of the department has not anticipated and met.

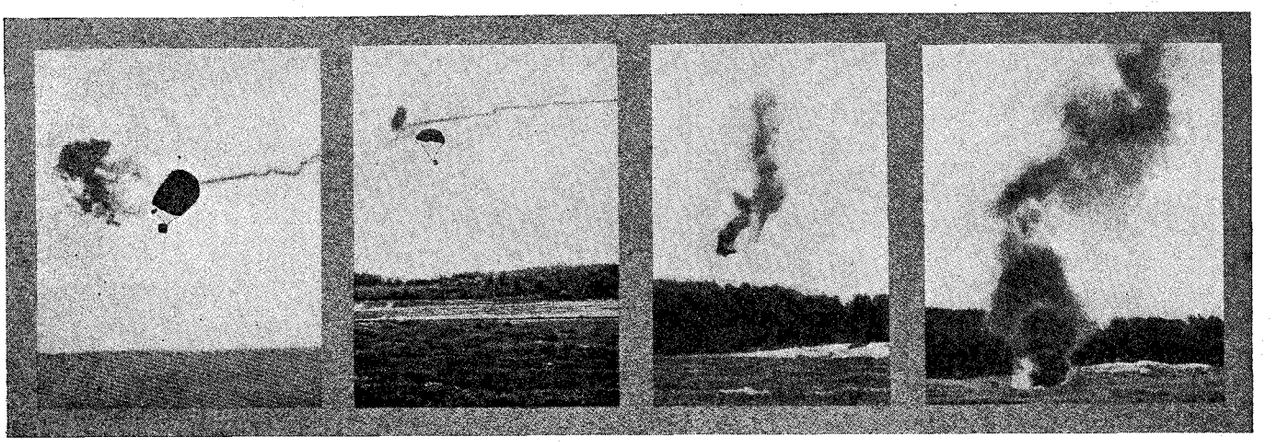
"Again, the 'atmosphere' of the shop and that of the office are quite different. In the former every man has been trained from the first to be actually, or appear to be, engaged during every minute of the working day. The non-producer is inclined to view his service otherwise, and without any particular force or inducement to push his work through, plods along at about 50 per cent. efficiency much of the time, or with pulsations of great vigor during a 'rush,' with periods of idleness intervening. . . . . .

"Improvements in organizations always involve some cost in addition to a close study of every phase of the situation. The workings of the forces should be under observation for a considerable period, and careful records made of any irregularities in the routine, just as we watch an engine performance or the output from a group of tools. All mechanical combinations operate at maximum efficiency when under a uniform load approximating that for which they are designed; especially does this apply to those which consume fuel or utilize energy from such combustion. Why is not the human structure similarly regarded, and the same principles applied throughout? . . . Business life indoors should not be influenced by the conditions of temperature without, humidity, depth of snow, protracted wet or dry spells, approaching holidays, or other causes which seem, in many instances, to be the pacemakers for daily activities. In the summer we find a high temperature an excuse for postponing all matters of importance, yet the one who suffers least from heat is he that is too busy to note it. A sharp thunder-storm will reduce efficiency in the average office to about 20 per cent. as a result of the customary methods therein, while during the same outburst the shop production maintains its average."

ANOTHER GYROSCOPE MONORAIL SYSTEM—For a type of railway that has never yet been put to practical commercial use, the gyroscope monorail seems to be doing pretty well. Besides the Brennan and Scherl systems, both of which have been described in these columns, there is now a third, the Schilowsky, based on the same principles, but carried out differently. A reduced model, according to *Le Génie Civil* (Paris, August 20) has recently been tested with success in London. Says this paper, as quoted in *Cosmos* (Paris, September 3):

"The system has but one balancing gyroscope, which is carried on a sort of bogie truck placed between two cars. The first car is a motor and carries a boiler furnishing steam to the engines that drive the car and to two others on the bogie, which together operate the gyroscope.

"The gyroscope, which is at one end of the bogie, is controlled directly by a small one-cylinder steam-engine running on a vertical axis in a frame carried by members turning about an axis perpendicular to the direction of the track. At the other extremity of the bogie is a heavy pendulum, swinging about a pivot parallel to the rail, and therefore hanging sometimes to the right, sometimes to the left, according to the inclination of the car. Its movement causes, by means of a motor connected to another small steam-engine, a displacement of the gyroscope in the proper direction to maintain equilibrium."—*Translation made for* THE LITERARY DIGEST.



THE SHELL PIERCES THE BALLOON, EXPLODES, AND TEARS THE ENVELOP. THE BALLOON FALLS, TAKES FIRE, REACHES THE GROUND, AND BURNS UP.

FIRING ON A BALLOON.

## FIRING BIG GUNS AT BALLOONS

SOME TIME ago we described a piece of ordnance devised and manufactured by the Krupps for use particularly against military balloons. We now reproduce from *La Nature* (Paris, August 27) photographs of some tests of this weapon. The target in this case was a captive balloon, practically at rest. Even this was a difficult object to reach, and a moving air-ship would be a still harder nut to crack. The writer of the article thinks that a near-by or crippled balloon will be at the enemy's mercy, being quickly destroyed by his guns, but that an active dirigible at considerable height, or still more, a swiftly moving aeroplane, will be practically impossible to hit. We read:

"The balloon is movable, and it is very hard to realize its distance and height; the prospect of regulating aerial fire would appear at first sight very problematic. It is well known that artillerists regulate their terrestrial fire by approaching the object with successive shots that overreach and fall short. How shall we find whether a shot has fallen short or the contrary when the projectile is thrown into the air? Fire on balloons will almost always take place at great angles, and artillerists know that in such fire the aim is much more difficult than in fire at low angles. Besides this, there is one more unknown element.

"When the axis of the gun is slightly inclined to the horizon, the only elements that must be adjusted in taking aim are the inclination and direction of the gun. But when the fire is at high angles a third element comes in—the charge of powder. The charge necessary to reach a target situated at a known distance from the gun varies with the angle of fire. Of course a charge can be used that is always sufficient to reach the target. . . . This is to say that the ranges will always be long. How then shall the distance, always somewhat troublesome, be regulated?

"This is not all; it is not enough that a shell should reach the balloon (if a dirigible is in question) if it does not touch some vital part, say the motor or the screw. Even if it passes through the envelop it will not necessarily paralyze the air-ship. That the projectile may be effective, it must burst just after contact with the balloon; the envelop, torn in all directions, can then no longer hold the gas, and the balloon will come to the ground.

"Besides these technical difficulties, there are others that are tactical. How shall the dirigible be pursued? How shall the best position for firing be found? How will it be best to combine the action of several pieces of artillery, or of several batteries?

"It may be seen that artillery fire on balloons demands the solution of difficult problems. But the rapid progress of military aerial navigation requires their solution with little delay. A new weapon is born. Apparently the study of aerial artillery fire has been advanced most actively in Germany, but it has been pursued also in France, and we believe that at the ensuing army maneuvers an automobile gun-carriage, with special ordnance, will be given the task of pursuing dirigibles and aeroplanes.

"The photographs presented herewith were taken during experiments made by the Krupps on small captive balloons. They will do service in showing how it may be possible to control the fire. The projectile was a 'fumigen' shell which leaves a record of its flight in the air as a smoke-trail and enables the spectator to see easily whether the projectile passes over or under the target, or to its right or left. The flame and smoke that render the trajectory visible have also the effect of setting fire to the balloon's envelop and bringing it to the ground.

"If the dirigible descends too near the enemy, or is surprized by him when maneuvering against wind or rain, it is certain that it will present a very vulnerable target. On the other hand, if it is able to regain a great altitude at the moment of danger, the efficiency of gun-fire against it would seem to be very problematic. The aeroplane, more flexible, less bulky, and less fragile than the dirigible, and making 40 to 50 miles an hour, will offer to hostile shots a still more difficult target, and may snap its fingers at any terrestrial gun, even when mounted on an automobile."—*Translation made for* THE LITERARY DIGEST.

## THE FARMER'S AUTOMOBILE

THE PURCHASE of large numbers of automobiles by farmers is declared by *The Iron Age* (New York) to be one of the most significant incidents of the year. The farmer's motor-car, says this paper, instead of being an expensive toy, like the city man's, is an economy—an investment bringing adequate and satisfactory return. To quote:

"To the average man in the city the automobile is merely a luxury, and a very expensive one. What he is obliged to pay simply for storage is a formidable item. Accidents on crowded streets are frequent and costly. Repair men are quick to take advantage of a customer who is unfamiliar with machinery. It is probably not unfair to say that there are now in use in the large cities more automobiles than there are people who can really afford the outlay for a mere luxury.

"In the country, however, the city man's toy becomes an economic investment, which brings satisfactory returns on its cost. The farmer's time is valuable. Nature allows him only a few days in which to harvest any particular crop, and his season is correspondingly short in planting and seeding. In a critical period, when conditions are most favorable for planting or harvesting, the time that the automobile saves in necessary errands makes it an economic agency of production. The mere saving of time, however, is only a small part of the usefulness of the automobile in the country. A few years ago there was much pessimistic talk about the tendency of farmers to 'retire' and live in small towns on the rent received from their land. The automobile is now keeping the owner on his land. His family, who wanted to live in town for social advantages, has discovered that it is more satisfactory to enjoy the full income of the farm and own an automobile which can run to the city in the time that would be spent in walking a few blocks