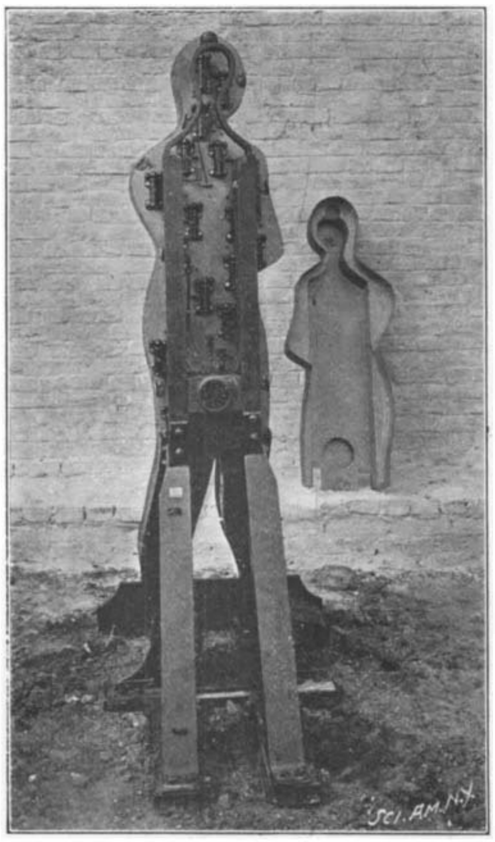
CHEVALLIER ELECTRIC TARGET.

Capt. Charles Chevallier, of the French army, collaborating with M. Eugène Cadet, has invented a most ingenious target which is so constructed that the hits are registered by an annunciator. By means of this device, the marksman simply by referring to the annunciator can ascertain at a glance what his success



BACK OF THE DUMMY TARGET WITH COVER REMOVED.

has been without walking several hundred yards to the target.

The target itself consists of two sets of metal panels of segmental form, arranged in different vertical planes. One series of segments overlaps to a certain extent the next series of segments, in order that an entirely full surface may be presented to the marksman. Behind each series of segments lies a fixed disk, serving as a guide and support for rods secured to the segments. Coiled springs are placed between the segments and the disk, in order to return the segments after they have been driven in by a projectile.

Opposite each rod, secured to the segments, an electric contact device is placed, which, as shown in our detailed views, consists of a screw, *h*, mutilated for about 7-16 of an inch. In its normal position, an insulated plate, *k*, having threads of a corresponding pitch to those of the screw, lies opposite the neck thus formed in the screw, and is therefore out of contact with the screw. The vertical screw, *h*, turns in a fixed nut or support, *i*. The upper part of the screw, *h*, is fitted with a crosspiece, *j*, provided with counterweights at its ends so as to form a balance member. The plate, *k*, constitutes one terminal of the circuit, the wires, *P*, being secured to the other terminal. The wires, *P*, are equal in number to the segments of the target and are assembled together in a cable leading to an annunciator of ordinary construction, placed near the marksman.

When a projectile strikes one of the segments, one or more of the springs, coiled about the rods, *e*, are compressed, and the corresponding rod or rods, *e*, are driven in through the perforations of the disk, *d*, and strike the counterweights of the balance member, *j*. The impulse thus given to the balance member, *j*, causes the screw, *h*, to turn and rise. The lower threaded part of the screw is then engaged in the screw threads of the plate, *k*, and the circuit is completed. When the circuit is completed the annunciator near the marksman indicates the exact spot of the target which has been struck.

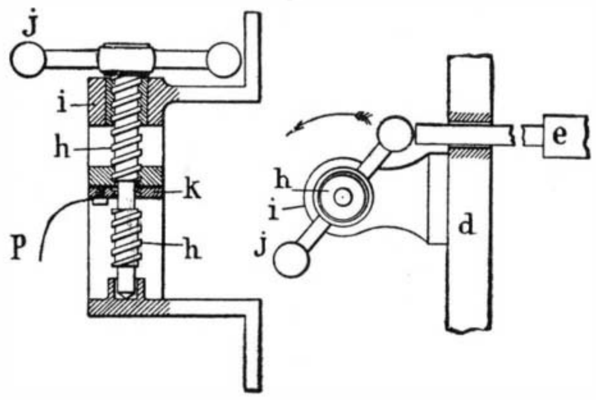
Instead of disks, portions representing the human figure can be used.

This electric target has been successfully used in the armies of France, Spain, Roumania and Portugal.

Heavy Engines Money Savers.

All new orders from the big railway companies are for monster freight engines these days, and not a few are of the compound type.

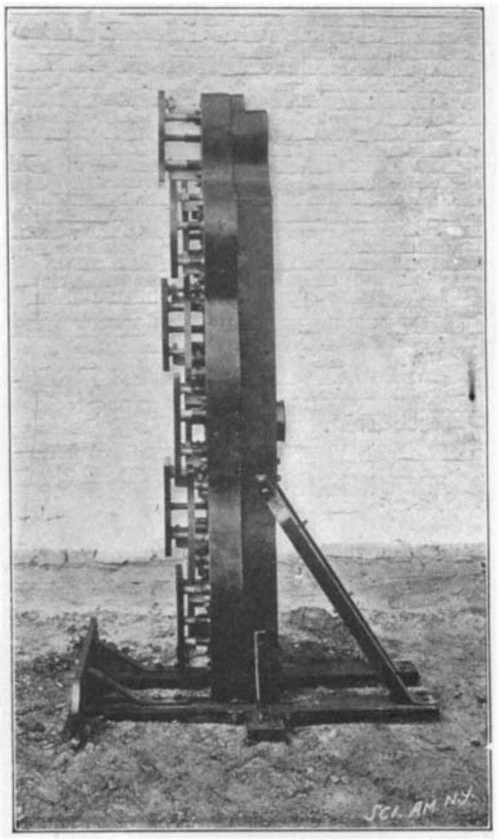
The Union Pacific, Oregon Short Line, Rio Grande system, Burlington, Illinois Central, Northern Pacific, Pennsylvania, New York Central, Rock Island, Colorado Midland, Colorado & Southern, Missouri Pacific, the Erie road and others, have large orders in for locomotives and all of them include great freight-hauling machinery. For the past year or two a particular study has been made of the power problem, and while there is some difference of opinion among master mechanics and enginemen upon some points, yet there is unanimity with reference to some general facts, and among these latter is the preference for heavy engines as money savers. A. W. Sullivan, assistant second vice-president of the Illinois Central, has paid great attention to this phase of railway operation, and his conclusions are entitled to much weight. He refers to the difficulties in the system of double heading, which constitute offsets to the economy of the plan in other respects. Among these are delays on the road, the consequent overtime, the damage that is done to cars in



ELECTRIC CONTACT DEVICE OF THE TARGET.

"sawing" trains at meeting points where the siding is not long enough to clear the main line, the difficulties of handling the train over hilly portions of the road, and the uncertainty of trains' moving on orders to make meeting points on short time.

Precisely the same conditions apply to the movement of trains with very large engines, contends Mr. Sullivan, who claims that the Illinois Central at one time had the two largest locomotives in existence. They were simple engines, with cylinders 23 x 30; they carried 210 pounds of steam, had 82-inch boilers, long fire-boxes. One was a consolidation, the other a 12-wheeler. It was sought to find out what this size of engine could do in the way of ultimate pulling capacity, so the order was given to start with a train of 1,500 tons on a run out of Chicago of about fifty miles, in the middle of which was the ruling grade of that district, about 24 feet to the mile; and each day the engine made the trip, increasing the train load by 500 tons until the train got to 3,500 tons, or 82 loaded cars. The engine hauled the train easily; the trouble was to handle the engine. This was about two years ago. When the engine arrived at the station at the summit of the grade, it had to cross over to the other track to let an important passenger train pass it, necessitating a short back-up movement to enter the crossover track.

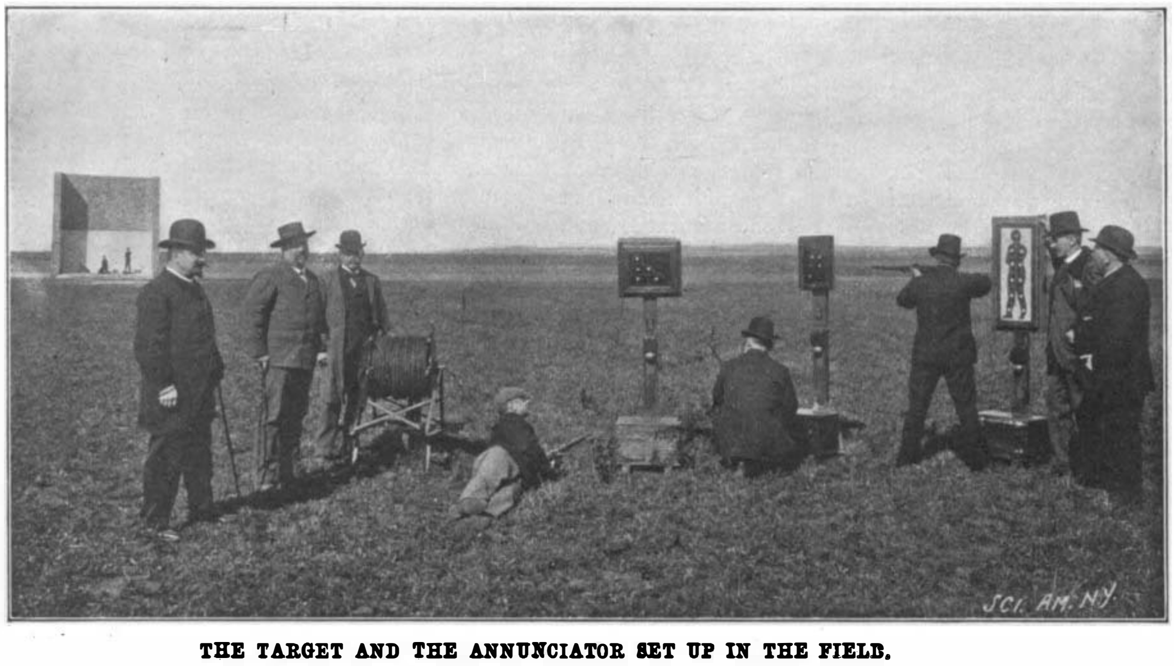


SIDE VIEW OF THE DUMMY TARGET.

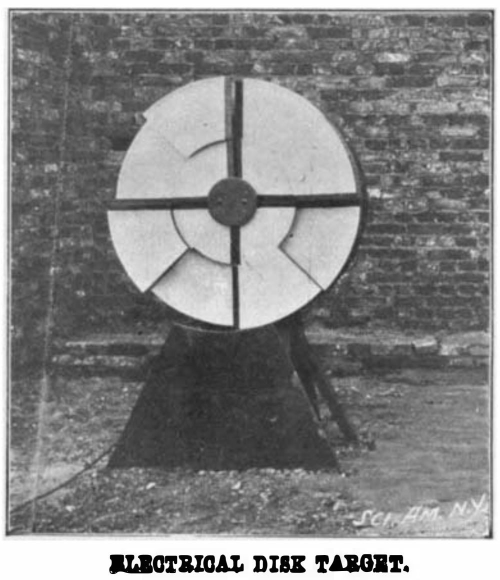
In making this back and forward movement the train broke in two eight or nine different times, on one occasion shearing the twelve 1-inch drawbar pocket bolts—so great was the power of the engine. Two hours and three-quarters were consumed in crossing over and getting back, and the train that it was intended to let by without causing any delay was delayed an hour and a half.

"We came to the conclusion," says Mr. Sullivan, "that it was quite possible to get an engine that was large enough to handle a bigger train than was practicable, as a transportation proposition, to move over the road.

"These large engines have now been in service nearly two years. We give them each trains of 1,800 tons on portions of the road where mogul engines of 19 x 26-inch cylinders handled trains of 900 tons. Each of the big engines takes a double train. The total expense of moving 10,000 tons one mile with the big engines is $1.86, as against $2.02 with the mogul. By reducing the train to a tonnage that could be handled readily, we have been able to operate the large engines successfully, having them take their turn in the service just as it comes—one day with a heavy coal train, next day with a stock train or with a banana train, making speeds anywhere up to forty-five or fifty miles an hour, and doing that without any trouble. We think that such an engine is, if anything, larger than economical locomotive practice demands, and we have purchased no more of them. We find that a mogul engine with 20 x 28-inch cylinders, carrying 200 pounds steam pressure, will take the same train over the road just as well as the engine with 23 x 34-inch cylinders. In other words, the 80-ton engine will do the work just as well as the engine which weighs 110 tons, and either of them will do better than a double-header."



THE TARGET AND THE ANNUNCIATOR SET UP IN THE FIELD.



ELECTRICAL DISK TARGET.