

distinguished from street and house lights would not under adverse conditions, such as a foggy atmosphere, be likely to be mistaken for red, and thus lead to confusion. It has been claimed that an engineman who should often find it difficult to decide whether or not a light was red would become careless and would put all reds and yellows in the same class; and thus would sometimes run past a stop signal, taking it for a home signal.

**VULNERABILITY OF THE SUPERPOSED TURRET.**

In a supplementary report of the Naval Board on Construction, of which Rear-Admiral O'Neil is president, extended reference is made to the weakness of the superposed turret looked at from the point of view of defense. The report contains a diagram of the "record practice" target made by the British cruiser "Terrible" plotted on a projection of the end-on view of the superposed turrets. There can be no question, the report says, that the placing of the 8-inch turret on top of the 13-inch turret considerably increases the danger of disablement of the 13-inch turret and also of the 8-inch turret itself. This is very conclusively shown in the following extract from a report on the protection of gun positions, wherein a comparison is made between certain foreign and our own battle-ships of the "Kentucky" class, by a well-informed officer of the navy. In regard to the chances of total disablement from either an internal accident or a small shell entering the port opening, he says:

"A baseball tossed into one of the ports would fall directly into the 13-inch handling room, opening into which are the 13-inch magazines, and below which are some of the 8-inch magazines. In action, at least four charges would be exposed, either in the ammunition hoists or ready to be put into them. There can therefore be no reasonable doubt that the explosion of a large or even medium caliber shell in the 13-inch turret would not only inevitably destroy the guns' crews and put the entire system out of action, but would, in all probability, explode the 13-inch and 8-inch magazines, as well as the 5-inch main magazines that are immediately adjacent to them, thus entailing the complete destruction of the vessel."

With reference to the additional danger of disablement of each turret, due to the fact of their superposition, he says:

"I have appended a sketch showing a projection of the end-on view of the superimposed turrets against a British 'record practice' target; and on the latter I have plotted the actual record made by H. M. S. 'Terrible' in 1900. \* \* \* The target, therefore, represents the fire of the guns on one side; that is, six 6-inch guns during four minutes. \* \* \* The 'Terrible's' record showed 104 shots and 80 hits with the 6-inch guns on the regular target (16 by 20 feet). Seventy-nine of the 80 hits would have struck one or the other of the 'Kentucky's' turrets. \* \* \* Twenty-six and six-tenths per cent are on the 8-inch turret. As these shots would have passed over a single turret and been wasted, it is clear that the 8-inch turret, in this position, acts as a 'save all' for line shots going too high, and that consequently its chances of being hit are much greater than if it stood by itself. \* \* \* Projecting the 'Canopus' turret or shield against the target, it will be seen that it would have received 36 per cent of the 79 shots, or 45.5 per cent, thus illustrating the relative value of the low target."

The experience gained with the double turrets on the "Kearsarge" and "Kentucky" has been sufficient, says the report, to show that the features of the design, so far as they relate to the mechanical means of operation, are successful; but the features of the design, so far as they relate to the efficiency of the superposed turret as a weapon of offense, have not been developed by any practical tests. The guns have been fired at target practice in various ways, some defects in the gun mountings have been developed and remedied, but no serious test of the four-gun turret, to compare its efficiency with the two-gun or one-gun turret, has ever been made.

It is clear, from the line of argument adopted in the beginning of this statement, that it is perfectly practicable to make a test of the turrets of the "Kearsarge" and "Kentucky," which would determine the efficiency per gun from actual trial.

The general outline of the tests would be as follows:

A large target should be used, say 60 feet long at the bottom, 20 feet high, and 30 feet long at the top. This target should be anchored and moored with its length parallel to the course which the ship shall take. The firing should take place at ranges varying from about 2,500 to 1,500 yards, with the vessel moving from 6 to 8 knots per hour, and extend over a length of time of not less than twenty minutes. The "Kearsarge" should make the following runs over the course:

- (1) Firing the starboard 13-inch gun of the forward turret.

- (2) Firing both 13-inch guns of the forward turret.
  - (3) Firing all four guns of the forward turret.
- The "Alabama" should make the following runs:
- (1) Firing one 13-inch gun of the forward turret.
  - (2) Firing both 13-inch guns of the forward turret.
- The "Brooklyn" should make runs similar to those of the "Alabama," firing the 8-inch guns of the forward turret.

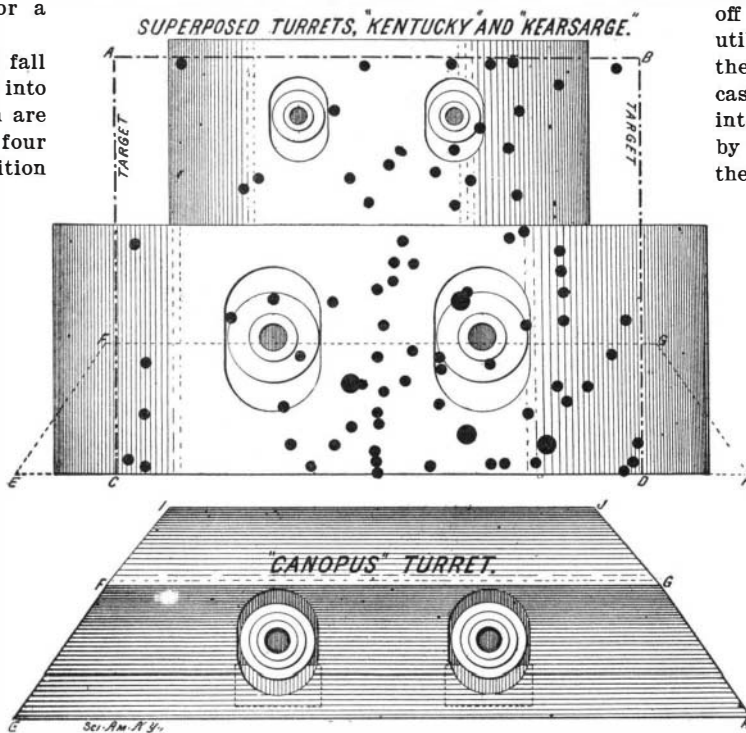
NOTE.—Actual hits only to count.

These tests certainly should be made, and the results would be required to show a very high order of efficiency in powers of offense to justify the adoption of a device which has such transparent defects in defense.

**A New Weaving and Dyeing Process.**

A German engineer, Otto Hallensleben, has recently invented a most interesting weaving and dyeing process, which gives promise of making a revolution in those industries. The new process practically gives a monopoly in the manufacture of carpets and rugs of the Oriental type and of similar tufted and pile fabrics. The new method has been established on a commercial scale, and for our description we are indebted to Fielden's Magazine.

In the old process, which dates from 1839, the color is placed upon the yarns after they have been wound in position, side by side upon drums. The drums are provided with a collapsible section, and on their



A B C D, Record Target, area.....	320	square feet.
E F G H, "Canopus" Turret, area.....	122.5	" "
F I J G, Sloping Roof, area.....	55.5	" "
Superimposed Turrets, area.....	352	" "
Number 6-inch shots fired.....	104	
Number of hits on Record Target.....	80	
Number of hits on Superimposed Turrets.....	79	
Number of hits on 13-inch turrets—73.4 per cent.....	58	
Number of hits on 8-inch turret—26.6 per cent.....	21	
Number of hits on "Canopus" turret, front—45.4 per cent.....	36	

The above target represents the firing of:

Six 6-inch guns firing during.....	4	minutes.
Two 9.2-inch guns firing during.....	6	" "

**RECORD PRACTICE OF CRUISER "TERRIBLE," PLOTTED OVER SUPERPOSED TURRETS.**

periphery an index is marked off in spaces equal to the width of the surface of the pile or loops required in the finished fabric. One end of the frame in which the drums are mounted can be lowered or taken away from the central shaft. Beneath the drums is a tramway on which a truck or carriage is run which contains a vessel holding one of the coloring mixtures required for printing or coloring a section of the yarn, according to the design or pattern which it is intended to reproduce. When the truck passes under the drum, the pulley revolving in the color mixture impinges against the yarn and colors the portion of the surface marked off by the index. This process is repeated, the truck passing backward and forward and the drums turning so as to expose the portion to be printed in each case, while the coloring receptacles containing various colors are substituted, one for the other, until the whole surface of the yarn has been treated. Gum or starch is necessary to cause the colors to adhere, and in order to make the color penetrate the yarn and to remove the excess, the labor of two assistants is required to operate the scrapers. The excess color is entirely wasted. The collapsible drum permits of the yarn being placed on a temporary carrier and it is then conveyed to a steamer which sets the colors. It is then washed and dried and is ready for the loom. The process, while a great advance on the older ones, requires a great amount of labor and a considerable number of operators. The process is wasteful and to some degree inaccurate.

All these drawbacks are entirely removed by the new process. In general construction and action the coloring apparatus resembles a slide lathe with its compound sliding rest. The printing or coloring

trucks are operated automatically, traversing the whole length of the printing bed, backward and forward without stopping, unless checked to permit the printing of the various sections of the yarns staked off in conformity with the patterns which it is intended to reproduce in the fabric. For the checking of the trucks the Jacquard apparatus is used, the needles of which are put in action by a card coming in contact with them whenever the distance allotted for their journey is completed, in stopping them after they have traveled the width of one loop, two loops, etc., as required by the design. Thus, for instance, if the design requires that a certain color shall be impinged on section number 2, of the white yarn, or section number 20 for printing the second loop, or on section number 40 for the third loop, the card will be stamped accordingly and the truck carrying the color will be checked at the places indicated, to enable the printing to be done by means of an automatic device placing a pair of jaws in contact with the portion of the yarn that is to receive the special color, and the operation is performed by one or more small color pulleys, the number varying according to the class of yarn used for the fabric in the course of manufacture, whereby an ingenious combination of mechanical devices the exact amount of color required is previously measured off so as to prevent all waste. On the other hand, the amount measured off and held between the top and bottom pulleys is utilized to the fullest extent, and not impinging on the surface of the yarn merely, as is clearly the case in the ordinary presses, but is thoroughly rubbed into the yarn by these pulleys, which are actuated by the jaws accompanying a reciprocating motion by the mechanism referred to. Section number 2 having been treated in this way, the truck recommences its journey until section number 20 is reached, when it is stopped in order that the process may be repeated, and so on until the whole yarn is colored and ready for the operation of setting the colors. Any number of colors may be applied simultaneously by employing a corresponding number of printing trucks. Without interruption the process continues by bringing into action a device which automatically transfers the multi-colored yarn on a truck, conveying it to a steam tube 9 inches in diameter, having its opening directly opposite the coloring machines; and the moment the truck is admitted the door of the tube closes, steam enters the tube and the setting operation takes place in about a quarter the customary time. The process is a continuous one, the coloring and printing operations being duplicated, so that the second quantity of yarn is prepared for printing while the first quantity is being printed and steamed. The two sections of the machine are alternately used. The washing of the yarn is also automatically performed by special mechanism.

Mr. Hallensleben's other textile invention is a loom of the type known as double-fabric loom, by which two connected pieces of pile fabric are woven simultaneously and by one operation, being separated as the weaving proceeds by severing them in the center. Its weight is over 10 tons. It is 35 feet in width by 10 feet in depth and 8 feet high. The work that is being done on it at present is the weaving of a Turkish fabric 10 feet in width. Looms of greater diameter and of the same construction can be built to manufacture fabrics 30 feet wide.

**The Current Supplement.**

The current SUPPLEMENT, No. 1338, is begun by an interesting article upon the "Georgia School of Technology" accompanied by 10 engravings, showing the students weaving, dyeing, etc. "Enameling at Paris" is an important technical article. "The Clarke Automatic Coaling and Weighing Barge" is accompanied by a number of engravings, showing in detail how the work is performed. "Amplification of Weather Forecasts" is by Prof. Alfred J. Henry, and is illustrated by four engravings. "The Sculptures of Santa Lucia Cozumahuapa, Guatemala, in the Hamburg Ethnological Museum," is a very interesting archaeological article. "Some Recent Advances in General Geology" is an important paper. "The Mercadier Telegraph" is accompanied by many diagrams. "American Locomotives in England.—II." is published in this issue.

**Contents.**

(Illustrated articles are marked with an asterisk.)

Automobile news.....	119	Notes and queries.....	125
Books, new.....	124	Philippine islands, conditions in*.....	121
Cathedral, damage to St. Paul's.....	114	Plants, movements in*.....	116
Developers.....	118	Rangénder.....	122
Electrical notes.....	119	Russ. device for straightening*.....	116
Engineering notes.....	119	Science notes.....	115
Fabrics and tests.....	115	Shan rock II.....	113, 122
Fire department drills school*.....	120	Shan rock I, I. and Columbia.....	114
Force, electro-motive.....	118	compared.....	114
Fountain, luminous*.....	122	Steam heating.....	118
Glass for signals, yellow.....	122	Steel, structural.....	114
Grain elevators*.....	117	Supplement, current.....	123
Indicator, engine*.....	116	Teuberage*.....	120
Inventions, recently patented.....	124	Trade and higher education.....	114
Locomotive, freight*.....	116	Turrets, vulnerability of super-imposed.....	123
Mangoes in India.....	120	Wasting.....	123
Nordenskjöld, death of Baron.....	115	Weaving and dyeing process.....	123