TRIAL OF SIDE AND DECK ARMOR FOR THE UNITED STATES BATTLESHIPS KEARSARGE AND KENTUCKY.

It is gratifying to note that the Harveyized armor plate which is being manufactured for the United States Navy continues to show in a high degree the qualities of hardness and toughness for which the re-forged plates are famous.

The accompanying engraving was made from a photograph of a test plate which was recently fired at with a ten inch gun at the Naval Proving Ground, Indian Head. The plate was one of a set of face-hardened, reforged, nickel steel plates, which is being furnished by the Carnegie Steel Company for the side armor of the Kearsarge. It measured 7½ feet in height and 16 feet in width and tapered from a thickness of 16½ inches to 9½ inches. The plate was set up with the thick edge of the plate down and the outer surface vertical, the center of the plate being normal with the line of fire. It was backed with 12 inches of oak and ½ inch skin plates. The plate was secured to the structure by six holding-in bolts, and the distance between gun and plate was 334 feet. In the first round a Carpenter shot weighing 500 pounds was fired from a 10 inch breech loading rifle. The striking velocity was 1,293 feet a second and the striking energy 5,802 foot tons.

TEST OF FACE-HARDENED NICKEL STEEL SIDE ARMOR FOR THE KEARSARGE.

Shot No. 1.—Weight, 500 pounds; velocity, 1,293 foot seconds; penetration, 4 inches.
Shot No. 2.— " 500 " " 1,850 " " " 9 "

The projectile struck the plate at the point marked No. 1 in the engraving and smashed to pieces, the head of the shot remaining in the plate. Fifty-nine fragments in all, weighing 78 pounds, were picked up in front of the plate. The effect upon the plate was slight and very local. The backing was uninjured and there was no apparent effect on the skin plates. The estimated penetration was four inches. The diameter of the splash was 10 inches and of the flaking 14 inches. The plate where it was flaked seemed to be of very fine quality. The plate was then attacked with a 10 inch Wheeler-Sterling armor-piercing projectile, weighing 500 pounds, which was of extreme hardness from the point to 1½ inches in rear of the bourrelet. The striking velocity was 1,850 feet a second and the striking energy 11,877 foot tons.

The projectile smashed on the plate, the head remaining embedded. The projectile broke up much less than that of the first round, thirty-two pieces being found in front of the plate, their total weight being 353 pounds, and the largest piece weighed 53½ pounds.

The estimated penetration was 9 inches. The plate was dished at the edges of the flaking to about ¼ inch below the general surface. The backing was uninjured and the skin plates were slightly bulged out at the top edge, where the bolts were carried away in the previous round. The second armor bolt from the right edge in the center row was carried away, and the lead washers of the third and fourth bolts of the same row were sheared off. The excellent behavior of this plate resulted in the acceptance of the group of armor which it represented.

We have also received interesting particulars of the ballistic test of two protective deck plates, 1¾ inches in thickness, manufactured by the same company. They represented a group of plates which will form the protective deck of the United States battleships Kearsarge and Kentucky.

The plates were clamped at the ends without backing, and were set up in such a position as to make an angle of about 7° between them and the line of fire. A 6 inch gun, firing an armor-piercing shell weighing 100 pounds, was used, and the shell was delivered with a striking velocity of about 1,800 feet a second.

The first shot made a gouge in the plate about 27 inches long and dished it to the depth of about 3 inches. The shell was thrown off and was broken into a number of pieces, and the bulge at the back of the plate was uncracked. The result of the test of the second plate was similar to that of the first, except that the back bulge was slightly cracked. In this round, also, the shell was badly broken up. As neither plate showed any injury other than the gouge at the point of impact, they are justly considered to be of very fine quality.

The importance of such deck armor can scarcely be over-estimated. The flat trajectory of modern shells, due to their high velocity, will insure that the angle of impact, when they strike the protective deck, will be comparatively small. The chance of the shell being deflected is further increased by the arrangement of coal bunkers above the armor belt and in the wake of the boilers and machinery.

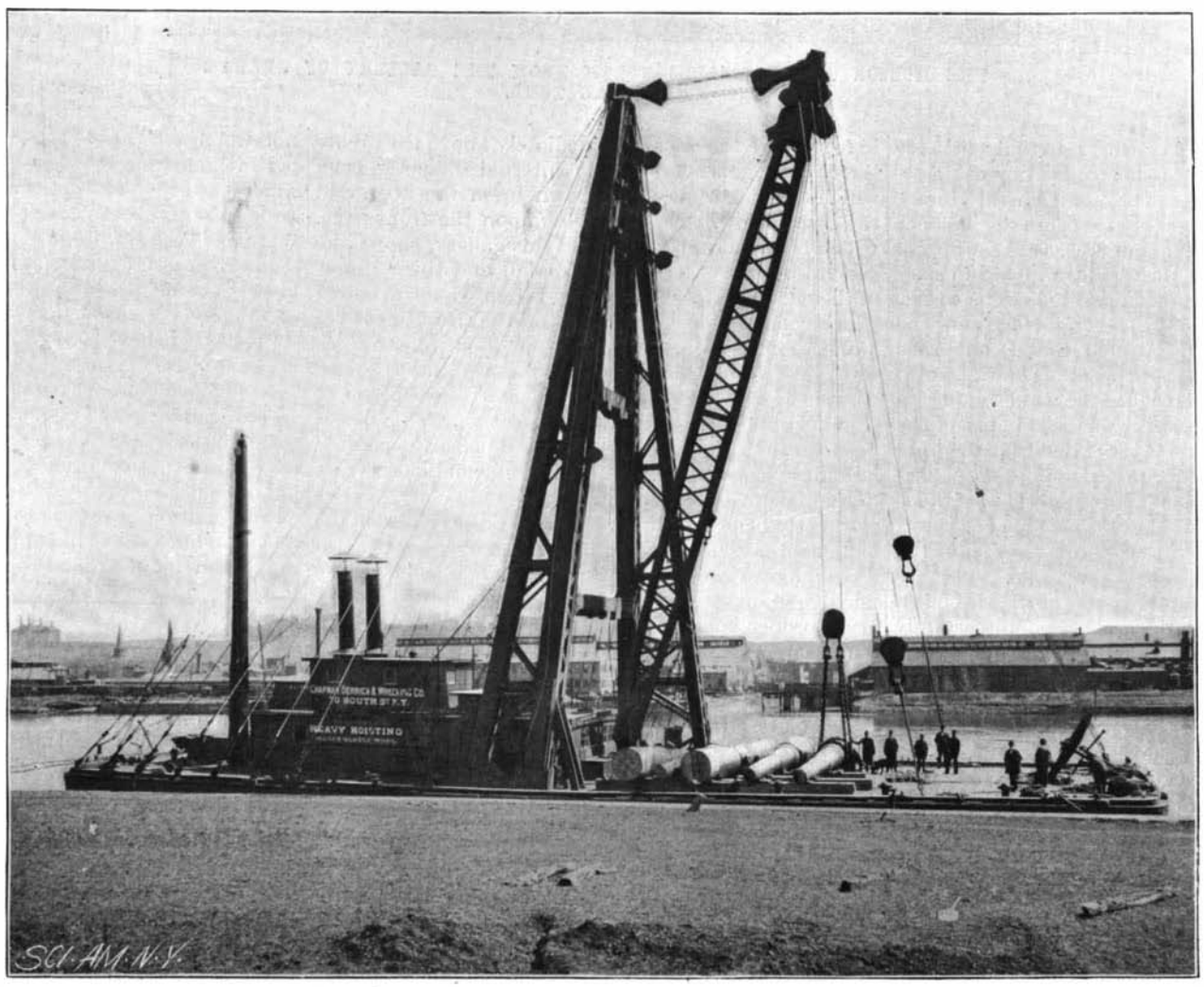
The Largest Automobile.

This is claimed by Australia, says the Popular Science News. It was built in California, and some idea of its size may be gathered from the fact that it utilizes 75 horse power, an unheard of amount for this new form of vehicle. This particular car will travel between Coolgardie and the coast, and is intended merely for goods. It will pull over rough roads two other wagons. Coolgardie is 400 miles in the interior, and up to the present time all supplies for the men at the diggings have been transported by the old wagon system, a wearisome task. It was considered impracticable and too expensive to construct a railway to Coolgardie, so the idea of a big motor car was hit upon. As water is scarce on the road to Coolgardie, the steam is not exhausted into the air, but saved, reconverted into water, and again used.

HEAVY SHIPMENT OF ARMY CANNON.

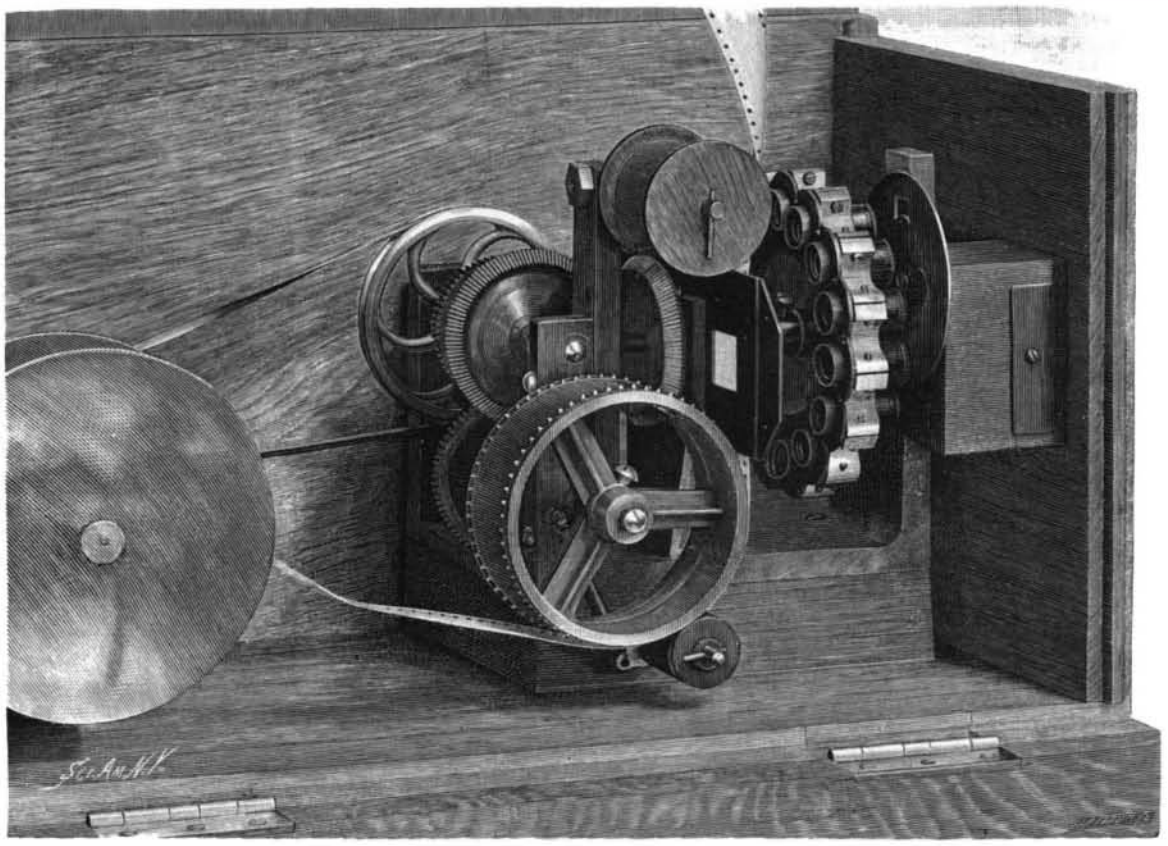
Probably the largest shipment of heavy sea coast, breech-loading, steel rifled cannon ever made at one time and place was successfully accomplished a few days since at the Watervliet Arsenal, near Troy, and the guns, forty-six in number, are now lying at the government proving ground, at Sandy Hook, awaiting their proof test of five full service rounds each before mounting in fortifications.

The contract for the transportation of the guns was awarded to the Chapman Derrick and Wrecking Company, of New York, and the opening of navigation on the Hudson was marked by the arrival at Troy of the enormous floating derrick Monarch. Arrangements had already been made for the prompt delivery of the guns at the arsenal dock by means of a short line of railroad extending from the shops and a steel platform car especially built for the handling of the heaviest guns. The breech mechanisms were detached from the guns and separately boxed, and the highly finished interiors of the guns were protected at breech and muzzle by wooden tompions and lagging.



HEAVY SHIPMENT OF ARMY CANNON.

As soon as the large barges provided by the contractors had arrived at the dock, they were carefully inspected by the officers of the post, and, the report being satisfactory,



RIBBON PHOTOGRAPHY—A NEW CAMERA.

the loading of the guns was begun. The car was run into the center of the main gun shop, a building 160 feet wide and nearly 1,000 feet long. A gun was then picked up by one of the large traveling cranes, gently lowered into a cradle prepared for it, and the loaded car run rapidly down to the dock. Here the gun was seized by the monster derrick and swung over the deck of the barge, upon which it was lowered and securely blocked, while the car returned to the shop for another gun. As fast as one barge was loaded it was towed aside and another took its place. When all the barges had been thus loaded there were still left five 12 inch rifles, which were placed upon the deck of the derrick itself. The boom of this derrick is a steel built beam 90 feet long and weighs 70 tons, so that as it swung clear across the barge and over the dock, and lifted a gun weighing 116,000 pounds, the list of the float was considerable, but this occasioned no trouble or uneasiness to the experienced handlers.

This shipment comprised forty-six guns, as follows: Fifteen 8 inch rifles of 32,480 pounds each, nineteen 10 inch rifles of 67,200 pounds each, and twelve 12 inch rifles of 116,480 pounds each. The total weight of these guns is considerably over 3,000,000 pounds, and their total value or actual cost is about a million and a half dollars.

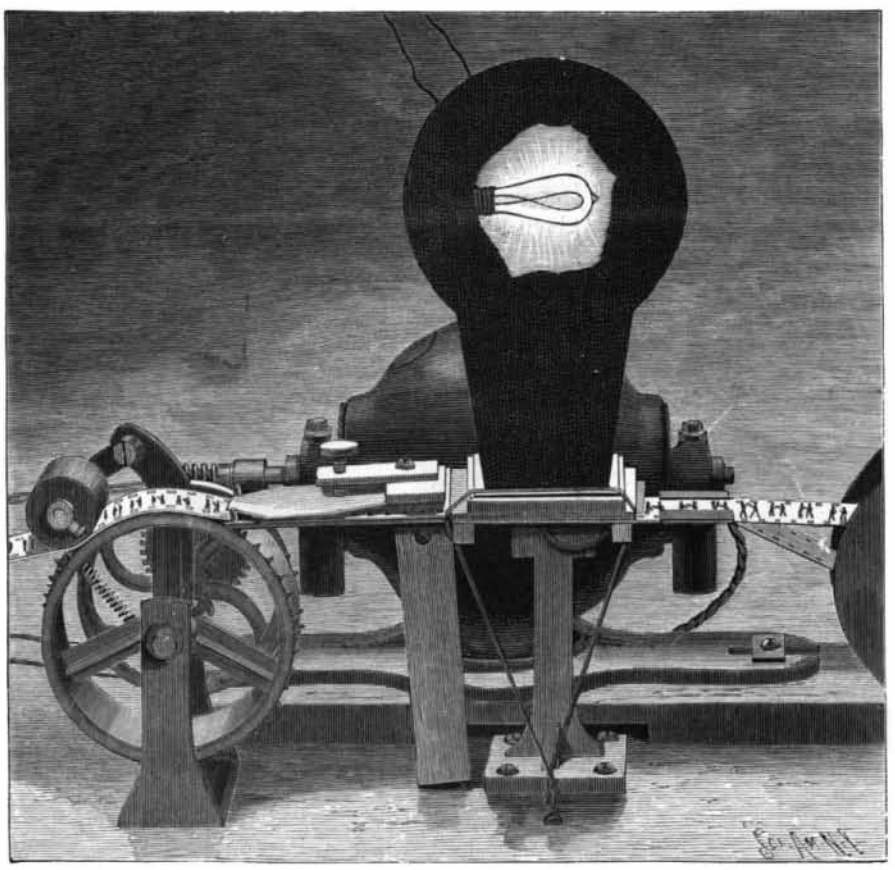
The guns are of steel throughout and of the best American make, which is carefully inspected and tested by the ordnance officers at various stages of manufacture. Each gun consists of a steel tube the full length of the gun (about 36 feet in the case of the 12 inch), over which is fitted a second tube called the jacket, which in turn is enveloped by shorter tubes called hoops. The jacket and each successive layer of hoops are carefully bored to a diameter less than that of the tube and preceding layer of hoops. They are then expanded by heat until they can readily be slipped into their correct position, so that in the process of cooling the various parts of the gun are bound together with enormous power. The exteriors of the guns are then smoothly turned in large lathes and the breech mechanisms, "finished like a watch," are accurately fitted.

The 8 inch rifle fires a steel projectile of 300 pounds with a charge of 125 pounds of powder, giving a penetration in steel armor of 14 inches at 1,000 yards; the 10 inch rifle discharges a steel projectile of 575 pounds with 250 pounds of powder, and gives a penetration in steel of 18 inches; and the 12 inch gun is served with a steel projectile 4 feet long, weighing 1,000 pounds, and with a charge of 500 pounds of powder gives a penetration of 25 inches in solid steel. The extreme range of these projectiles is from ten to twelve miles.

Powerful as are these weapons, they are to be followed shortly by immensely more powerful ones, and preparations are now in progress at the arsenal for the manufacture of a 16 inch breech-loading rifle of 125 tons, which will be served with a charge of 1,000 pounds of powder and a steel projectile of 2,300 pounds, giving a calculated penetration in solid steel of 32 inches at 1,000 yards. It is not believed that any vessel can be built which will successfully resist the terrible impact of such a projectile hurled against it with a velocity of nearly 2,000 feet per second.

Simple Lawn Ornamentation.

The early flowering crocus, with its brilliant blossoms, and the lovely daffodils, beautiful as they are everywhere, are never more attractive than when seen among the grass along a wood border, or judiciously scattered in irregular locations about a lawn. It is better that they should not be seen in every direction as one looks over a lawn, giving an idea of monotonous planting, but in groups or stretches with intervals or reaches of grass between. Thus scattered they furnish individual flowers for our gratification and make a charming picture in the distance. Some varieties of these flowers will grow persistently and increase from year to year, while almost any of them will bloom for a season or two. They like well-drained meadows which are covered with snow most of the winter. They ripen before the grass is fit for mowing, working trifling harm to the hay crop and yielding a harvest of beauty that is exquisitely satisfying.



RIBBON PHOTOGRAPHY—EXPOSING AND PRINTING APPARATUS.

A NOVEL CHRONOPHOTOGRAPHIC CAMERA.

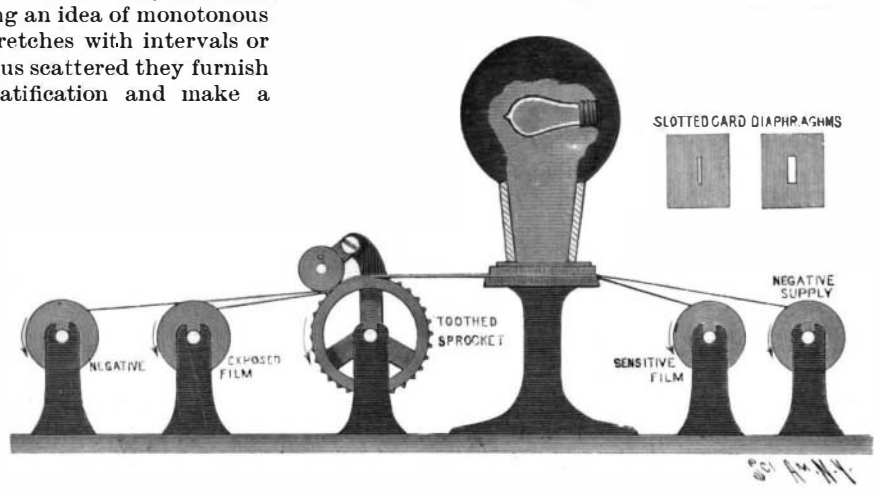
Since the introduction of ribbon photography, by means of which successive pictures are rapidly made of moving objects upon a long ribbon or strip of sensitized film, various devices have been invented, some complicated and others very simple, for the production of the pictures and the manipulation of the picture ribbon.

In the large engraving is illustrated quite a novel camera, the invention of G. Francis Jenkins, for making accurately the continuous series of pictures. Instead of using a rotary disk shutter with radial apertures and a fixed lens, this camera has a single opening in the front, the size of the aperture being regulated at its rear end by a diaphragm disk having radial slots cut therein of varying widths. The operator is thereby enabled to govern the amount of light admitted to the lenses according to the subject to be photographed and the length of exposure desired. This disk is rotated by hand on its axis like an ordinary stop in a wide angle lens.

Back of the diaphragm disk is observed the battery of lenses, each of the same focus, arranged in a circle, adjoining each other upon a rotating disk, the axis of which extends rearward, terminating in a bevel gear wheel, which meshes into a side bevel gear wheel, fixed upon the upper shaft, suitably geared to the main driving shaft. The main shaft may be operated by a crank on the outside of the box, by hand or by any suitable motor like a spring. The sensitized celluloid perforated ribbon film will be noticed passing downward near the front end of the camera in front of the exposure tension plate, the square aperture in which is exactly in line with the front aperture in the box. From this point the film, after exposure, passes downward between the sprocket wheel and pressure roller to the winding reel in the rear end of the camera, which is rotated by belt connection to a pulley on the upper shaft, and takes up the film ribbon as rapidly as it is exposed. The feed roll for the supply of fresh film is not shown, but may be located in the rear of the camera over the winding reel.

The operation may now be readily understood; to obtain successive pictures of a particular object, the camera is placed on a stand or tripod, the crank on the outside is then rotated, which causes the film to travel downward continuously, with exactly the same speed that the lenses rotate, so that at every fraction of a second that it takes for each lens to pass behind the camera aperture, an impression of light is made on the downwardly moving film, and as they (the lenses and film) both move in unison, it follows that a sharp picture must be the result, while the brilliancy of the illumination is at its maximum. The camera can be carried about as readily as any other camera, and in practice it is found the motion of the hand-operated crank is sufficiently uniform to permit of the proper reproduction of motion by the positive pictures when projected on the screen.

The other illustrations show the method of printing the positive ribbon pictures from the negative by means of artificial light, also designed by Mr. Jenkins. It consists of reels supported on suitable upright standards holding respectively the sensitive ribbon film and the negative film. The film from the negative supply reel is carried along over the sensitive film reel and both pass in contact, in continuous motion, under an exposing chamber illuminated by white light, either incandescent electric light or a Welsbach gas light, thence over the toothed sprocket driving wheel to the winding reels, the exposed film being wound first. It will be noticed that the reels are interchangeable, hence to make duplicate



RIBBON PHOTOGRAPHY—DIAGRAM OF THE PRINTING DEVICE.