

froth too much; (8) the gun is shown in the loading and firing position in Figs. 1 and 2 respectively, can be lowered by turning a crank handle in connection with gearing which is arranged so as to slack off some of the springs, or without slacking off the springs, by a small block and tackle attached to the breech end of the gun.

The makers have also embodied the following improvements in this mounting: (a) Automatic sighting gear, the same as has been so successfully applied to turret guns for the navy; (b) a sighting platform—A in Figs. 1 and 2—placed at the side of the gun clear of its recoil, and fitted up with training, elevating, and firing gear, so that the eye may be kept on the target up to the moment of firing; (c) a pair of reflecting mirrors, moving with the leaf of the tangent sight B, by means of which the sights can be seen from below the shield. It should be noted that no inaccuracies can arise from the use of the mirrors, as the actual sights are reflected in them, and they are arranged so that the image is not inverted. Night sights and a telescopic sight can be used if required; (d) various alterations and improvements about the shield.

These advantages are obtained by designing and constructing the carriage in the following manner: The weight of the gun is counterbalanced in any position of its path by steel springs, designed so that at every point there is always a proper proportionate amount of spring power to support the gun, with a trifle in excess, to cause it to rise to the firing position if allowed to do so. This counterbalancing of the gun is in no way connected with the recoil press, but is an action carried on independently of it. The strength of the springs can be regulated by compressing them or allowing them to extend, by a screw and nut arrangement worked by a hand wheel. When the springs are sufficiently slacked off, their tension is insufficient to support the weight of the gun, and it lowers to the loading position. This gear therefore takes the place of the lowering pump of the hydro-pneumatic disappearing carriage, but has the advantage of taking less time and labor. There is no danger that too much of the

supporting power will be removed, because the springs can only be slacked a definite amount sufficient to lower the gun carefully, but not to let it fall at a dangerous speed. The recoil press would also check any undue speed. The springs are placed in compression, not tension, so that the breaking of a spring would be a matter of no great moment. It is not, however, at all likely that a spring will break, as experience has shown that the same pattern of spring in the six inch quick-fire mounting stood hundreds of rounds, and in that case the spring is compressed at the same speed as the gun recoils, whereas in the disappearing mounting the spring is only compressed at a third the rate of recoil. Provision is, however, made for inserting a new spring if necessary.

The recoil press is made as a plain cylinder, mounted on trunnions, and fitted with a piston rod and piston. On recoil, all the liquid below the piston passes to the upper side of it through a port, which varies in size to suit the varying velocity of the recoil in such a manner as to produce an equal pressure throughout the stroke and at the same time to give always a full recoil. It is important to have a full recoil with disappearing guns, even with a three-quarter or a half charge, so as to bring the gun to the proper height for loading. The recoil press is cast with a tank on the top of it, to receive the liquid displaced by the ram or piston rod on the recoil of the gun, and this tank is made large enough to give a certain storage of liquid, so as to insure the cylinder always being full. A most important point is that leakage of oil is guarded against by not fitting plugs or cocks in the cylinder, the necessary filling and air plugs being inserted in the tank. When

necessary the oil can be drawn from the cylinder by a siphon or syringe, so that there is no need for a draining cock or plug. To prepare the recoil press for service: With the gun down fill up the press by the filling plug on the tank until no more oil can be got in.

To increase the efficiency and rate of fire it is proposed to use a quick-firing gun, and for this purpose a rear platform is provided, and two sets of ammunition boxes to carry the metal cartridge cases. The numbers loading will be carried round as the mounting is trained, and will, therefore, be able to load the gun as rapidly if mounted on a naval carriage, an extra five seconds only being required for the gun to rise.

Both the training and elevating gear are arranged so as to be worked either from the emplacement floor or from the sighting platform. At the sighting platform two training wheels are provided, one within reach if the ordinary or the telescopic sight is being used, and the other when the mirrors are in use. Only one elevating wheel is necessary, as it is well within reach at all times. C shows the winch and training gear worked from the emplacement floor. The mounting can be trained on the object, and the elevation adjusted while the gun is in the loading position, so that on the gun rising to the firing position, it may be fired immediately, as no further adjustment is necessary. With the automatic sights the greatest accuracy and ease of movement is secured for laying on the object before the order to raise the gun is given, so that the

at 4 deg. 20 min. depression. The time taken by the gun, not loaded, to rise to the firing position was found to be four seconds. When fully loaded with 55 lb. of powder and 100 lb. projectile, it was five seconds. The trials were most successful, and we understand that the officers attending were impressed with the simplicity of the new mounting and the facility with which it could be handled.—*The Engineer.*

A GIRDER GAS PIPE.

This self-supporting gas pipe was erected across the Morris Canal by the United Gas Improvement Company, of Jersey City. The canal is the old dividing line between old Jersey City and Lafayette. To span the canal at the least possible cost the company erected a pipe made of plates of sheet iron. It is made of 1/4 inch iron and is 42 1/2 feet in length from pier to pier. It is 3 1/2 feet in height and 1 foot in width. It is put together in five sections, each section being 8 1/2 feet in length. The top and bottom sections of the pipe are flanged and are closely riveted to the side pieces. The side pieces are made secure by means of 1/4 inch iron plates, 11 inches in width, riveted over the joints. The pipe is curved and rises in the center about 12 inches. The ends of the pipe rest in grooved castings on the tops of the piers and are made secure by means of bolts 1 inch in diameter, which pass through the castings and up along the sides and through the iron plates on the top of pipe, where they are held in place by heavy iron

nuts. Small iron braces placed about 8 feet apart and fastened to the bridge keep the pipe from swinging back and forth in case of storm or high winds. The street pipe which projects above the ground surface is about 2 feet diameter, and is made in two sections riveted together. The connection between the two pipes is V shaped, and made of the same material as the main pipe, the small end being hammered out to conform to the shape of street pipe. The pipe weighs about four tons and was erected at a cost of about \$900.

The Sugar Trust.
By the purchase or rather admission into the trust of the refinery of Claus Spreckels, at Philadelphia,

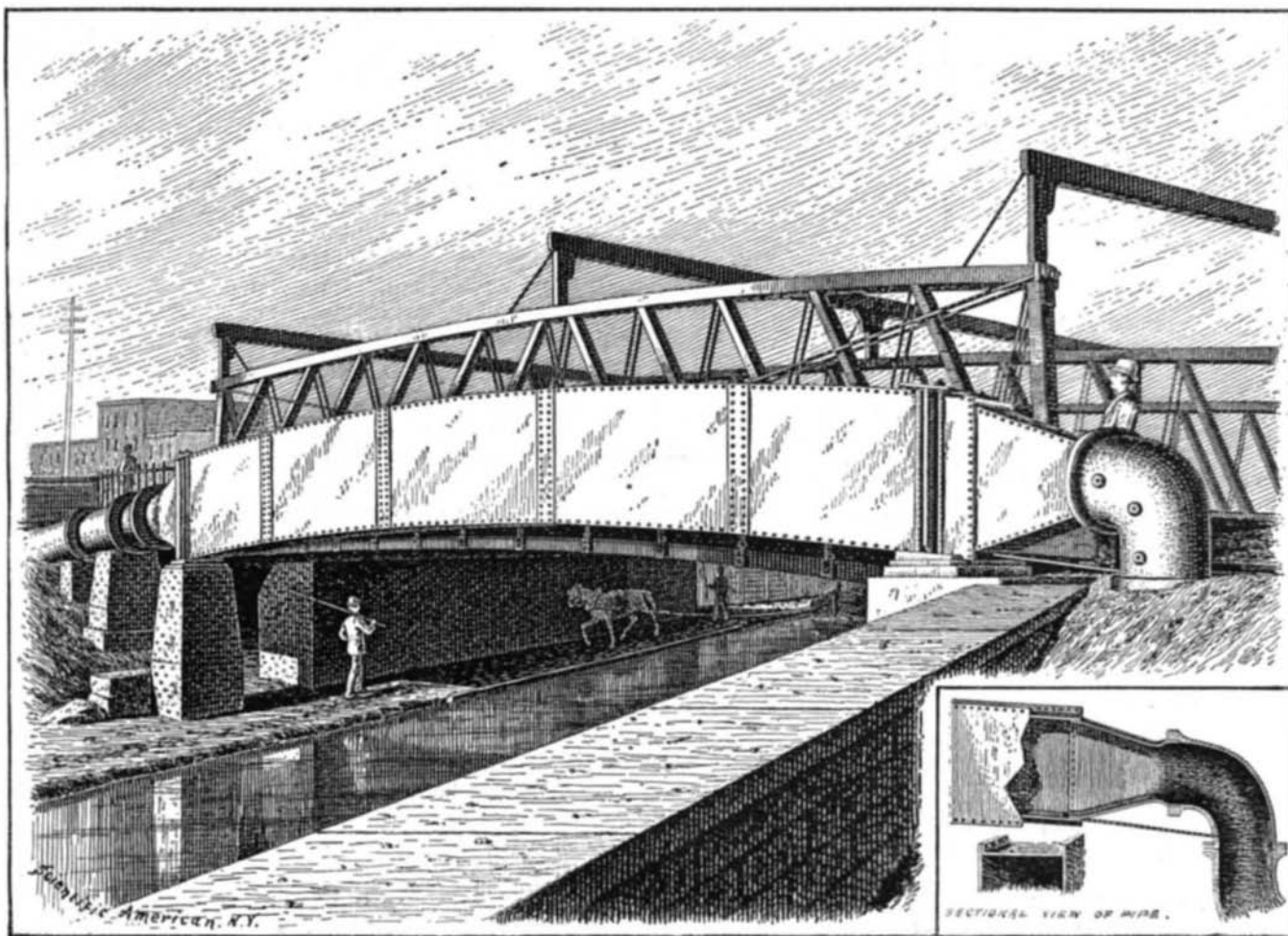
the Sugar Trust completed its operations for the control of the sugar refineries of the country. The following are the refineries owned absolutely by the trust, with their daily capacity in barrels:

The Havemeyer & Elder S. R. Co., Brooklyn.....	8,000
The Brooklyn S. R. Co., Brooklyn.....	3,000
The Decastro & Donner S. R. Co., Brooklyn.....	3,000
The Havemeyer S. R. Co., Brooklyn.....	3,500
The Havemeyer S. R. Co., Jersey City.....	500
The F. O. Matthiessen & Wiechers S. R. Co., Jersey City..	4,500
The Standard S. R. Co., Boston.....	3,000
The Boston S. R. Co., Boston.....	1,500
The Continental S. R. Co., Boston.....	500
The Forest City S. R. Co., Portland.....	500
The St. Louis S. R. Co., St. Louis.....	1,000
The Louisiana S. R. Co., New Orleans.....	3,000
The Louisiana S. R. Co., New Orleans, and the Planters' S. R. Co., New Orleans.....	3,000
The Franklin S. R. Co., Philadelphia.....	6,000
The E. C. Knight S. R. Co., Philadelphia.....	1,300
The Spreckels S. R. Co., Philadelphia.....	3,500
The Delaware S. R. Co., Philadelphia.....	500
The Baltimore S. R. Co., Baltimore.....	1,500
Total daily capacity.....	44,800

—*N. Y. Com. Bulletin.*

Sending Insects by Mail.

Large-bodied insects should never be mailed or sent by express when pinned, without first fastening the bodies so that they cannot break, and thus damage the rest of the specimens in the box. A little cotton drawn out and turned around the pin so that it holds tightly near the thorax, and then brought around the end of the abdomen and again fastened to the pin, will be found sufficient, especially if a few pins are used around the body to prevent its otherwise moving.



A GIRDER GAS PIPE, JERSEY CITY, N. J.

gun need be above the shield only some two or three seconds at the most. This mounting will go on the same racer and live rollers as the present six inch hydro-pneumatic disappearing carriage, and the same training rack may be used.

The electrical firing gear is arranged so that the circuit can only be completed after the gun is properly in the firing position, and with the quick-firing gun the further precaution of having the gun closed and locked. The shield is rigidly supported on platework, so that the gun and sights may always retain the same relation to one another. A combing is raised round the edge of the port or opening in the overhead shield, through which the gun rises, and when out of action this opening is covered in by a tarpaulin stretched tightly over the combing. This will be found handier than using a tarpaulin large enough to cover the whole of the shield.

The official trial of the mounting was carried out at the Silloth range on October 23, 1891. The following officers were present on behalf of the War Office: Colonel Colquhoun, R.A., Colonel Walker, R.A., and Major Penton, R.A. Three rounds were first fired with a three-quarter charge, at a target 9 ft. square at 1,000 yards range, using the automatic sighting gear, with very satisfactory results, each shot striking the target. Three rounds were then fired with the full charge, at angles of elevation of 5 deg., 10 deg., and 15 deg., respectively, for testing the strength of the structure. Finally two rounds were fired with a half charge, in order to show that the recoil of the gun was practically the same as with the full charge. The first of these was fired at 5 deg. elevation and the second