PITTSBURG DISPATCH, SATURDAY, FEBRUARY 9, 1889. THE

HOW TO BUILD GUNS. Development of Projectile Weapons

Since the Date of -----THE INVENTION OF GUNPOWDER

10

Different Processes of Manufacturing Modern Cannons.

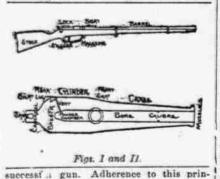
SOME SMOOTHBORE AND RIFLED GUNS

WRITTEN FOR THE DISPATCH.1

T is not known ex actly when man first sought to confine the forces resulting from the combustion of gunpowder and to utilize them for purposes of destruction, History

fails to furnish more than a more allusion to the existence of any such means. It gives no details of forms, construction or effect. Gunpowder, as a combustible material, is known to have been used by the terial, is known to have been used by the Chinese before the Christian era, and they knew enough of its explosive effects to con-that point would require. The finished gun fine it within the walls of a shell or bomb, and were able in a measure to control the time of its ignition. The historic Greek fire was forced from the months of tubes set in the bows of ancient vessels of war, and the secret of its manufacture was religiously guarded for centuries. Stone balls were used at the siege of Constantinople, and tradition tells of stone guns from which they were fired, and even as late as the middle of the fourteenth century there exists a doubt as to whether cannon were used in the battles of Edward III. Later on, in this century, however, we hear of them, and from that time to this they have been recognized as deciding elements in a nation's greatness. The process of development has been an exceedingly slow one, considering the amount of thought and experiment brought to bear upon it, but it was not until within the last 25 or 30 years that any real progress was made in the science of gun construction.

Iron, in some form or other, has always been regarded as the most valuable metal for this purpose. Bronze has been extensively used, brass and copper, and tradition tells us of even precious metals beirg melted and cast into gun shapes, but iron has survived all others, and when strength and durability are required, it furnishes the only material to be depended upon. The well-known forms of this metal are cast iron, wrought iron and steel. From the time of the first cannon until about 1840, cast iron was the only form of iron used. It was supposed that weight of metal to resist recoil and simple strength to withstand rupture were all the essentials to a



a long series of experiments with pressure gauges inserted in holes bored through the cylinder and chase of the gun at various distances from the powder chamber.

If the figure of the vertical divisions be taken as units of pressure and the horizontal divisions (representing the bore of the gun) be taken as calibers and A be regarded as the position in the bore of the center of the much as the rates between the thickness of the sides of the gun and the variation in pressure is not so great as the curve would call for. The greatest thickness is placed

A

Fig. III.

about the breech and cylinder and then has the appearance as shown in Fig. I. Beginning then the subject of construc-tion on the plans deduced from the curve of pressure, we have the cast iron Dahlgren gun, cast on what is known as the Rodman gun, cast on what is known as the rounant system. Most of these guns were cast here in Pittsburg, but I doubt if many of the readers of THE DISPATCH are iamiliar with the process. The pig metal is first melted in a reverberatory furnace, of such design that the metal is reduced by the flame alone and is not in contact with the

hame alone and is not in contact in carbon of the coal. In Fig. III, A represents the fireplace and grate bars, the flame passes over the bridge wall, B, and impinges on the heat of pig iron, which is placed in C. Great care is taken to prepare the furnace exactly as it was done for the standard gun, as the value of the metal was found to vary with the treatment very perceptibly. The next step is the construction of the mold or form of the gun. The composition used for mold-ing is a kind of loam containing sufficient clay to make it cohesive. A wooden model of the gun, called a pattern, is made, and divided up into sections, according to the size of the gun. The smaller guns can be modeled directly from the pattern. The XV in. gun has its pattern divided into five sec-

tions, each slightly tapering. The flask, Fig. II, aaa, is of cast iron, in several pieces, and flanged and bolted together. In making the mold the various sections are stood on a plate of iron, with their tapering ends downward. The pattern, or part of pattern, is then introduced, and the molding composition driven in the space between the pattern and section of flask. Patterns for the runners bbb are introduced when neces-As each section is completed the next one

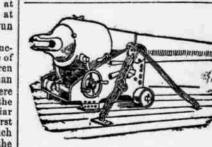
above it is placed on it, and the operation is continued until the mold is completed when the sections are taken apart again, and the patterns withdrawn and the sides of the mold smoothed and washed with a composition of coke-cinders, molasses and water. The core-barrel A, is a tube of sufficient length to reach to the bottom of the proposed bore, is of a diameter a trifle less than the finished caliber of the gun, is fluted throughout its length, rounded at its lower end and has a tube extending to its bottom and a journal cap at its upper end through which a stream of cold water is forced during the period of cooling. This core is wound around its entire length with small rope and then plastered over with

being shrunk over the inner one, and thus compressing it so that the inner hoops being nearest the shock of the discharge,

has its tensile strength augmented by the state of compression it exists under. Each intermediate layer to the outside, being under less contraction has less work to do, and is called upon to offer less resistance. This is called the system of initial tension. The position in the bore of the conter of the projectile, we see that the greatest pressure is exerted at and in rear of the projectile, diminishing rapidly as the projectile moves toward the muzzle. The metal in the gun is distributed differently, however, inas-is call the system of initial central. The other system consists in building guns of materials of varying degrees of elasticity, and placing the metal which stretches most within its elastic limit about the bore. This ratus. Each has its defects, the initial tension system, in that each tube or hoop has its inner circumference more stretched than its outer one, and then the mechanical difficulties in the way of turning down the outer surface

of the gun and the inner surface of each hoop as the process of building up goes on. The theoretically true hoop for this system is a very thin one, but of course as often as you increase this number of hoops, just so often do you increase the mechanical diffi-

culties in the way of handling them. The defect in the system of varying elasticity is in securing the proper metals. By a care-ful use of the principles of each of these systems with the increased strength of material consequent upon the improvements in the manufacture of steel and a knowledge of its capacity, we are able to build up guns that keep pace not only with the enormous requirements of force to carry tremendous proectiles of the day, but to withstand the shock of new explosives whose force is much

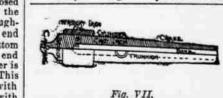


greater than that of gunpowder.

Fig. VII. The idea of a built-up gun is credited to a Prof. Tradwell, who, as far back as 1841, built a gun of short hoops of wrought iron welded together at their ends and their surfaces. The together at their ends and their surfaces. The The Parrott gun, Fig. VII, was the first one that met with success, and inits day was a very effective piece of ordnance. They are built on the principle of initial tension, and were used during the war very extensively, the navy being supplied with the 100-pounder and 60-pounder. They consist of a cast iron gun, strengthened over the breech by a coiled tube or hoop of wrought iron. The main body is made like an ordinary

cast-iron gun, except a little lighter at the breech, the 100-pounder with a core, the 60-pounder without. The exterior diameter of the cylinder when the hoop is to be shrunk on is turned down to an external diameter one-tenth of an inch to a foot greater than the finished internal diameter of the hoop. The wrought iron coil is made as follows: A bar of wrought iron of cross section, as seen in the accompanying figure, is bent around a mandril into a spiral shape, then heated and welded under the hammer within a strong iron cylinder, until it becomes a hoop, the principle being that the longi-tudinal strength of the bar is distributed about the circumterence of the hoop. The

wedged-shaped bar is used, because the outer part, having to bend more than the inner, is reduced in section, and the slag is also squeezed out in the process of welding, thus forming a more perfect weld. The main body of the gun is placed in a hori-



molding composition, dried and washed with zontal position, and a tube of cold water is

For To-Day Only.

screw to receive the threads cut on the outside of the larger part of the lining. This steel tube is made from an oil-tempered steel ingot, and has a finished exterior diameter of .001 of an inch greater Here is something that interests every than the casing. The original gun is placed vertically muzzle downward in a charcoal furnace and heated until expanded enough to admit of the steel tube being screwed. The old wrought iron band is re-placed by a new and thinner one, which ex-tends further forward, and the gun is then ready for its rifling and the breech appapensive manner, marked \$25, \$30, \$35, \$40, and take your choice and pick to-day only at \$10. Our new spring goods are arriving daily, and we must have room.

Time and space will not permit me to enter into the details of construction of one o

the new 6" rifles or the machine guns. In some succeeding issue of the paper I hope to be able to give a clear account of the methods employed in building our new guns, as they are popularly called; also something about the ammunition used and how it is made. TRUNNION.

LATE NEWS IN BRIEF.

-The bucket shops of Holman, Sprague & Skidmore, on New street, New York City, suspended yesterday morning.

-General Boulanger is about to proceed in the civil courts with his suits for divorce. There is every chance of his succeeding in his case in Paris.

-President Carnot attended a ball given at the Hotel de Ville last evening. A large crowd surrounded the building. On his arrival Presi-dent Carnot was given a hearty reception.

-The Secretary of the Treasury yesterday atternoon accepted the following bonds: 45 per cents, registered, \$527,600 at 108, \$50,000 at 109%, \$2,600 at 108%; 43% coupons, \$1,000 at 108

flat. -The agent of the East Africa Company has succeeded in obtaining the release of the Cath-olic missionaries recently captured by the in-surgents by the payment of a ransom to

-The Riverdale Cotton Mill, at Northbridge, Mass., was burned yesterday morning. The mills were owned and operated by the Whiting Manufacturing Company. Loss estimated at \$40,000, fully covered by insurance.

-The Court of Queen's Bench has granted a writ of habeas for Mr. William O'Brien in order that he may be arraigned in Killarney Court on Tuesday next on the charge of incit-ing tenants to adopt the plan of campaign.

-Judge Louis L. Williams, United States Commissioner at Juneau City, Alaska, em-phatically denies the report that Indian girls and women in Alaska are subjected to out-rages and abuses by the whites in that Terri-tory.

-Some of the most noted Radical leaders will address the meeting to be held in Hyde Park on Sunday. Elaborate preparations have been made for the event, and Mr. William Saunders, Charles Bradlaugh and others are expected to

-The armory of the Downpatrick jail was entered by unknown persons last night and a number of carbines were carried off. A force of soldiers and police was on guard at the jail, but the intruders made their escape without

-The following nominations were sent to the Senate yesterday by President Cleveland: Carroll D. Wright, of Massachusetts, Commis-sioner of Labor; Thomas M. Vance, of North Carolina, Receiver of Public Moneys at North Yakima, Wash. T.

Yakima, Wash. T. —Aithough Mr. Parnell has been present at the sittings of the Parnell Commission the last two days, the Dublin Express says that his health is in a very precarious condition. The carriage of Mr. Parnell's physician, the Express says, is often seen standing before the door of Mr. Parnell's villa at Streatham, and Mr. Par-nell seldom emerges from the house. nell seldom emerges from the house.

-Milwaukee Irishmen are greatly stirred up over the statements made by Major Beach be-fore the Parnell Commission regarding an al-leged meeting there with President Sallivan, of the National League, in May, 1883. J. G. Don-nelly, Register of Probate of that county, who is State Executive of the League, states that Beach's Milwaukee story is a rank piece of periury. perjury.

perjury. —The new method of charging for live stock per 100 pounds, instead of per carload, inaugu-rated by the Western roads January 1, has proved an expensive experiment. The action of the Kansas Commissioners, ordering the railroads in that State to cease weighing and charge freight per carload as formerly, will cause the abandonment of the new scheme at all neigt all points.

-A southbound local passenger train on the Delaware, Lackawanna and Western came into collision yesterday moralng with a freight train on the Northern branch crossing the Meadows, near Hoboken. Both trains were damaged and several persons were injured, but not seriously. The injured went to their homes and their names could not be learned. The accident was caused by the open switch of a "Y." BOARD OF PUBLIC IMPROVEMENTS, ST. LOUIS, JANUARY 8, 1889. Scaled proposals for the public work hereinafter mentioned will be received at the office of the Board of Public Improvements of the City of St. Louis, Mo., until 12 M. of the 23th day of February, -The troubles of the French Cabinet are by 1889, at which hour they will be publicly opened - The troubles of the French Cabinet are by no means over yet. Boulangerism proves too great a bete noir for some of the Ministry, and rather than to cope with it in what they con-sider a losing struggle they will resign. Further resignations are expected shortly, the general impression being that the members so inclined are merely retaining their portfolios until M. and read, viz. : For lighting with electricity for the term of ten years from January 1, 1880, the streets, public pinces and such public buildings as may be desig-nated in the following districts of the City of St. Louis, Mo., viz.: Letting No. 2,503. The district described as the Floquet can determine upon suitable success outhern district in ordinance numbered 14, 697, apfor them. proved December 29, 1888.

clothing buyer in Pittsburg. For to-day clothing buyer in ritisburg. For iterary only we offer you your choice and pick of any overcoat in our entire stock tor \$10, \$10. This means that you can look through our magnificent stock of imported kersey, chin-chilla and castor-beaver overcoats, silk and satin lined and trimmed in the most ex-

P. C. C. C., cor. Grant and Diamond sts., opp. the new Court House.

Don't Forget the Sale

Of Royal Worcester, Doulton, Crown Derby, Pointon and other artistic wares, besides real and imitation bronzes, French marble clocks, lamps, etc., that can be bought at a reduction of from 20 to 40 per cent from the market values, at W. W. Wattles', jeweler and importer, 30 and 32 Fifth avenue. This is an extraordinary of-fering, as in many cases the prices asked are less than cost of importation; but our object is to reduce the stock as much as possible, prior to sending our buyer to Europe. TTS

REAL ESTATE SAVINGS BANK, LIM.,

401 Smithfield Street, cor. Fourth Avenue. Capital, \$100,000. Surplus, \$38,000. Deposits of \$1 and upward received and

nterest allowed at 4 per cent. PROPOSALS.

DROPOSALS FOR BARGES-MISSISSIPPI PROPOSALS FOR BARGES-MISSISSIPPI River Commission, St. Louis, Mo., Febru-ary 8, 1889. Proposals are asked till 12 noon February 23, 1889, for building and delivering at Cairo, III., or Wilson's Point, La., thirty wooden barges, in lots of six barges. Attention of bidders is invited to the acts of Congress ap-proved February 26, 1885, and February 23, 1887, vol. 23, page 352, and vol. 24, page 414, statutes at large. Address as above, CAPTAIN CHAS. F. POWELL, Corps of Engineers, U. S. A. fe8-02-8,9,10,11,20.21

THE PENNSYLVANIA RAILBOAD COMPANY,)

OFFICE 238 SOUTH FOURTH STREET, PHILADELPHIA, February 7, 1889. OFFICE 233 SOUTH FOURTH STREET. PHILADELPHIA, February 7, 1888.) SEALED PROPOSALS ADDRESSED TO the undersigned (and marked on the outside "Proposals") will be received at this office until 9 A. M. February 28, 1889, for furnishing all labor and materials and erecting complete the proposed machine shop, erecting shop, boiler shop and smith shop, to be located in the city of Altoona, Pa. Proposals to state, separately, gross sum for (1) iron work, (2) brick and cut stone work, (3) mill and carpenter work, (4) tin and sheet-iron work and spotting, (5) plumbing and drainage, (6) painting and glazing for each building. Plans and specifications can be seen at this office, room 16 Annex building, and also at the office of H. W. Webber, Assistant Engineer, at Al-toona, Pa. This company reserves the right to reject any or all proposals. WILLIAM H. BROWN, Chief Engineer. Te8-564,12,14,16,18,20

res5649,12,14,18,18,20 PROPOSALS FOR MINERAL OIL -JEF-FERSONVILLE. Ind., February 7, 1889. Sealed proposals, in friplicate, subject to usual conditions, will be received here until 11 o'clock A. M. (central standard time), SATURDAY, March 8, 1889, and then opened, for furnishing at this Depot 100,000 gallons of Mineral Oil, of 185° flash test, in cases of two five-gallon cans each. Proposals for delivery of the oil at other points will be considered. The Government re-serves the right to reject any or all proposals. Preference will be given to articles of domestic production, conditions of quality and price (in-cluding in the price of foreign productions the duty thereon) being equal, and such preference will be given to articles of American produc-tion produced on the Pacific coast to extent of the consumption required by the public services there. All information furnished on applica-tion to this office. Envelopes containing pro-posals should be marked "proposals for Mineral Oil," and addressed to undersigned, HENRY C. HODGES, Assistant Quartermaster. Tes548,9,10,11,27,28

TO CONTRACTORS FOR ELECTRIC LIGHTING.

OFFICIAL-PITTSBURG. DROCLAMATION.

CITY OF PITTSBURG, SS.: In accordance with the Constitution of the Commonwealth of Pennsylvania and an ordi-nance of the City of Pittsburg, do there-fore make known and give this public notice to the citizens of said city qualified to vote for members of the House of Representatives of this Commonwealth, that a general election will be held in said city on the THIRD TUES-DAY of February, A. D. 1850, being the 19th day of the month, in the several election dis-tricts therein, at which time qualified voters will assemble at their respective polling places hereafter named and vote by ballot for mem-bers of the Select Council of the city, as indi-cate below:

<text>

Fourth district to meet at tenement house of E. Oxnard, on Wylie avenue. Fifth district to meet at station house, Center avenue. Sixth dis-trict to meet at Eureka Hall, on Arthur street. And elect one Select Councilman for said ward

And elect one Select Councilman for said ward. The electors of the Twelfth ward, Pittsburg, First district to meet at Fitzgeraid & Nolan's, corner Twenty-first street and Penn avenue. Second district to meet at Reed & Son's office, corner Twenty-fourth street and Penn avenue. Third district to meet at Twelfth ward police station, Penn avenue. Fourth district to meet at house of John Moessner, Penn avenue and Twenty-eighth street. Fifth district to meet at house of Mrs. McKenzie, corner Twenty-ninth and Smallman streets. The electors of the Sixth district to meet at the house of John prescribing their duties, granting appeals to Councils and Court, providing for the assessment and collection of damages and benefits, author <text>

OFFICIAL-PITTSBURG.

house of Jacob Nehron, corner Sarah and Twenty-fifth streets. The electors of the Fourth district to meet at the public school-house, corner Sarah and Twenty-fifth streets. And elect one Select Councilman for said

And elect one bence of ward, The electors of the Twenty-sixth ward, Pitts-burg, First district to meet at John Hughes' tin shop, Sidney street, near Eighteenth street. Second district to meet at house of Jacob An-lenbacher, Jr., corner of Eighteenth and Sarah streets. Third district to meet at Odd Fellows' Hall, Eighteenth street. Fourth dis-trict to meet at the house of John Mangsmann, corner of Twentieth and Jane streets. Fifth district to meet at the public schoolhouse,

corner of Twentieth and Jane streets.) Fifth district to meet at the public schoolhouse, Sarah street. And elect one Select Council-man for said ward. The electors of the Twenty-seventh ward, Pittaburg, First district to meet at the house of John Lamell, Weish way, Manor street. Second district to meet at Alderman B. A. Hartman's office, Pins street. Third district to meet at public schoolhouse. And elect one So-lect Councilman for said ward. The electors of the Twenty-eighth ward, Pittaburg, First district to meet at 1311 Washington street. Third district to meet at Birmingham schoolhouse. Fourteenth street. Fourth district to meet at No. 1417 Carson street, being back of Rashdorf's cigar store. And elect one Select Councilman for said ward. ward

And elect one Select Councilman for said ward. The electors of the Twenty-ninth ward, Pittsburg, First district, to meet at Bedford schoolhouse, Bingham street. Second district to meet at Alderman J. M. Shaffer's office, Tweifth street. Third district to meet at L Beinhauer & Son's office, corner Bradford and Tweifth street. And elect one Select Coun-climan for said ward. The electors of the Thirtieth ward, Pittsburg, First district, to meet at the house of J. W. Boyd, No. 163 Carson street. Second district to meet at the house of Matthew Keep, corner of Fifth street and Cavitt way. Third district to meet at the house of Matthew Keep, corner of Fifth street and Cavitt way. Third district to meet at Knox schoolhouse, Manor street. And electors of the Thirty-first ward, Pitts-burg, first district, to meet at Mrs. Ruckard's store, Washington avenue. Second district to meet at the premises of H. Heinrich, corner of Washington avenue and Allen avenue. And elect one Select Councilman for said ward. The electors of the Thirty-scond ward, Pitts-ward, First district, to meet at the house of Christ Wilbert. Second district to meet at the store of William Slatter, corner of Virginia ave-nue and Kearsage street. Third district to meet at small house of Phillp Hoffman, corner of Boggs avenue and Wyoming street. Fourth district to meet at the public schoolhouse, And elect one Select Councilman for said ward. The electors of the Thirty-third ward, Pitts-

ward. The electors of the Thirty-thid ward, Pitts-burg, to meet at the public school house. And elect one Select Councilman for said ward. The electors of the Thirty-fourth ward, Pittsburg, to meet at the house of Mrs. Creigh-ton, Carson street, near Point bridge. Second district to meet at the public schoolhouse. And elect one Select Councilman for said ward

ward. ward. The electors of the Thirty-fifth ward. Pitts-burg, First district, to meet at public school house, Sarah street. Second district to meet at the old stone tavern. Washington pike. And elect one Select Councilman for said

And elect one Select Councilman for said ward. The electors of the Thirty-sixth ward, Plitts-burg, First district to meet at basement of the German Evangelical Church. Second district to meet at public school house, Main street, Third district to meet at Odd Fellows' Hall, Steubenville pike. And elect one Select Coun-climan for said ward. In testumony whereof I have hereunto set my hand and afficed the seal of the City of Plitts-burg, this 5th day of February, A. D. 1889. fe5-91 WM. M'CALLIN, Mayor.

186-91 WM. M'CALLIN, Mayor. 180. 214.1 A ORDINANCE-AUTHORIZING THE A opening of Joel's lane, from Grandview avenue to Omaha street. Section 1-Be it ordained and enacted by the city of Pittsburg in Select and Common Coun-cils assembled, and it is hereby ordained and enacted by the authority of the same. That the Chief of the Department of Public Works be and is hereby authorized and directed to cause to be surveyed and opened within 60 days from the date of the passage of this ordinance. Joel's lane, from Grandview avenue to Omaha street, at a width of 35 feet, in accordance with a plan on file in the Department of Public Works, an ordinance locating the same, ap-proved March 1, 1884. The damages caused thereby and the benefits to pay the same to be assessed and collected in accordance with the provisions of an Act of Assembly of the Commonwealth of Pennsylvania, entitled, "An act authorizing and directing Councils of cities of the second class to provide for the im-provement of streets, lanes, allevs and public highways, sewers and sidewalks, requiring plans of streets, providing for the aspontment of a Board of Viewers of street improvements, prescribing their duties, granting appeals to Councils and Court, providing for the assessment

ciple lead to several crises when the guns became too heavy for management, and the gunmakers of the time were forced to invesigate the adaptability of other metals for their purposes. Bronze was always a favorite departure, and light field pieces were made and used by both the French and Austrians in the Napoleonic wars, but their efforts were mainly directed to the improvement of iron, and at the date referred to wrought iron made its appearance as a factor in gun construction. It gained favor slowly, receiving its greatest impetus when adopted by the English in 1856 for the manufacture of their Armstrong and Woolwich guns. The transition from wrought iron to steel was an easy and a natural one. The reasons for using wrought iron, instead of cast, were supplemented by the marked superiority o steel over either of them. The mathematical deduction of the theorist found in this metal the only factors that would satisfy his problem, and from that time to this gunmaking has been a science, a fine art, I might say, and steel has grown in favor until now it is recognized as the only metal capable of resisting the powerful explosives of the day and at the same time keeping within the limits of wieldiness.

Guns are divided into two general classes, "emoothbore" and "rified," and as regards their construction into "cast" or "built-up guns." It is well to remember that the term "small arms" applies to all pieces fired from the shoulders or hand "machine guns" to all arrangement of small arm barrels, discharged by some mechanical con-trivance, generally a crank that is turned by hand, while the term guns applies to all other pieces of ordnance. Smoothbores are designated by the terms 12 pdr.-32 pdr., signifying the weight of the solid shot, and the use of the Roman characters VIII in., IX in., XI in., and XV in., to distinguish the caliber or diameter of the bore. [See

Fig. II.] Rifles are designated by the use of the arabic character 3, 5, 6, etc., for caliber and the letters M. L. R. for muzzle-loading rifle or B. L. R. for breech-loading rifle.

Small arms are distinguished by their caliber-thus cal. 38, cal. 50, denote a diameter of the bore of .38 or .50 of an inch. Machine guns by their caliber as 37 m. m., 47 m. m. or 53 m. m., meaning 37 millimeters, about 1.46 in., 47 millimeters, about 1.85 in. and 53 millimeters, about 2.09 in., as applied to the Hotchkiss revolving cannon. The one pound rapid-firing gun, siz-pounder rapid-firing gun to the heavier Hotchkiss guns, while the Gatling, Gardner non. and Nordenfeldt are distinguished by their calibers in inches and by the terms long or short, according to the length of their bar rels. It is necessary for a proper under-standing of this subject that an explanation be given of the various technical expressions that will be used from time to time and the simplest way I think to bring them to your notice is by the accompanying diagrams whereon the various parts of the gun will be named:

The guns at present in use or in process of construction for use in the United States Navy are the IX in., XI in., and XV in. muzzle-loading smooth bores; the 8" con-verted M. L. R.; the 60-pound and 80-pound converted Parrott rifles, B. L. R.; the 12pound and 20-pound brass howitzers; the 3"B.L.R.; the 5", 6", 8", 10 'built up B. L.R., and the armament of the large harbor de-fense vessels is to call for 13" and 16" B. L. R. These two extremes, the cast iron M. L. S. B. and the built-up steel B. L. R., repre-



Units of Pressure. sent two periods in the history of this country when we possessed the finest ordnance in the world—the time of the civil war and the present day. The intervening 25 years have been spent in watching and studying the experiments of foreign nations, and the two types represent the ideal guns of their time. The Dahlgren gun, Fig. II, which we The Dahlgren gun, Fig. II, which we will first consider, derived its shape from the following curve of pressure, the result of

e fluted shape mits an escape of the gas resulting from the burning of the rope when surrounded by the melted metal. The pit P is a circular hole lined with brick. When all is ready, the lower section of the flask is placed in the pit, the next section above it clamped to it, and so on until the whole flask, with the model inside of it, is ready for the metal. The core is lowered into its place, accurately centered and held in its place by an arrangement called a spider S placed on top of the flask. The furnace is then tapped and the metal run into the mold through the runners bbb. The canals from the main channel all run upward, and the metal is stirred briskly

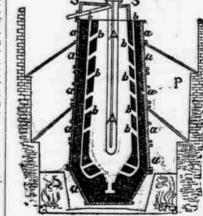


Fig. IV.

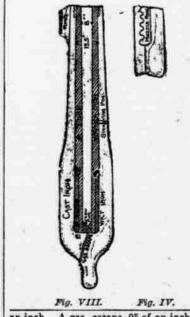
with green saplings to prevent the collection of scoria in the trunnion holes and to mix up the charges from the different fur-naces. The pit is heated by having fires built in it, and when the mold is full, the top of the metal is covered with pulverized charcoal and the pit with iron plates to prevent too rapid cooling. The core barrel is removed about 18 hours after the casting and a current of cold air forced in the cavity left. A XV gun take about eight days in cool ing, smaller calibers a proportionately less time. The rough casting is put in lathes and turned down to its exterior dimensions; then put in a boring lathe and the bore turned out; then in a trunnion lathe and the trannions turned down and the intervening netal cut out for the elevating screw through the cascabel, the vent is drilled and the gun is then ready for inspection. The X V inch gun is the only gun cast hollow. The others are cast solid, but the plan of operations is the same, except, of course, there is no core-barrel, and the sinking head or top of the casting is made heaving to con-dense the metal. Bronze guns are cast in much the same way. As they are all small, their pattern is first made in a lathe and then cut in two longitudinally. Cast steel guns, of which the 3" B. L. E. is the only successful one, are forged from an ingot of cast steel under the hammer. Built up guns are very different. Here it is the pur-pose of the builder to make all parts of the through the cascabel, the yent is drilled and pose of the builder to make all parts of the gun do its share of the work of resisting the explosion.



If Fig. V represent the end of a hollow cylinder of rubber, and you mark on it a series of concrete rings, you will find that if you drive a round stick into the hole α that you drive a round stick into the hole a that the rings will assume positions as seen in Fig. VI, that is, the inner rings are much more strained than the outer ones. Consid-ering a section of the cylinder of a gun in the same light, we find that each concentric layer from the bore out is less strained, those on the outside little or none, while in the larger calibers of cast guns the bore is often cracked. It was to remedy this defect, to make all parts take their proportion-ate share of the strain, that built-up guns were devised. There are two methods of

ssed into the bore. The hoop is heated to a degree which will permit its slipping on easily over the breech of the gun. When easily over the breech of the gun. this is done, the cold water is turned on and the main body turned slowly on its horizontal axis. This prevents the coil from sticking to the first point it touches, and the cold water carries off the heat as it is imparted to the gun. When the coil is found to have taken hold, the rotation is stopped and the whole is covered with some nonconducting material to prevent the outer surface from cooling and contracting more rapidly than the inner surface. The hoop extends for a distance of one caliber on either side of the powder and shot chamber. In 1872 it was decided to convert

some of the XI in. S. B. Dahlgren guns into 8 in. M. L. R. on a system combining the principles of initial tension and varying elasticity. A bar of wrought iron, shaped in section like that described for the manufacture of the coil of the Parrott gun, is bent into a spiral coil, heated and welded into a hoop or coil. Two of these coils are welded together to form a section and two sections form the A tube. This is bored out to within one-tenth of its final diameter and a water pressure of 140 pounds put upon it. After careful inspection it is put in a lathe and turned down at its rear end from a to b. Fig. VIII, to receive the B tube. This is constructed in the same manner and is shrunk in over the breech end of the A tube with a shrinkage of .003 of



an inch. A gas escape .05 of an inch deep and .1 of an inch wide is cut spirally around the reduced portion of the A tube and communicates with a hole bored through the breech of the gun. Should any crack occur in the A tube in that part covered by the B tube, the escape of gas through the gas check would at once give warning. A screw plug closes the bottom of the bore.

The XI in. gun is bored out to a diameter of 13.5 inches and a thread cut at the muzzle for the muzzle ring. The A tube, with its B tube shrunk on it, is turned down to accurately fit this new diameter of the bore, allowing only .007 of an inch at the breech and .005 of an inch at the muzzle. When the tube is in place a muzzle ring, Fig. IX, is screwed in and a steady pin screwed through the casing into the tube to prevent it from turning. These have made very effective guns and have proved a valuable addition to the service covering

ALLAGA. CART INC

doing this-one by making the gun of a series of concentric hoops, each outer one

-Minister Preston got a dispatch from the Haytian legation, yesterday morning, saying that the British and French Governments have officially recognized General Legitime as Presi-dent of the Haytian Republic. The Minister any this announcement will greatly assist in restoring order in Hayti. The steamer Caron-dolet, which is supposed to be chartered by the Hippolyte party, and which is ready to sail for Hayti with a cargo of explosives, is still at her anchorage, in the lower hay, New York.

anchorage, in the lower hay, New York. —The works of the Pacific Guano Company, at Woodsholl, Mass., were attached Thursday by the Lynn Institution for Savings, and they have assigned to John C. Ropes, of Boston. Li-abilities about \$1,000,000. The company's head-quarters are at Boston, and, beside the works, they have mines at Beaufort, S. C., and works at Charleston, S. C. The selling agents of the company are Glidden & Co., of Boston, who are indorsers of their paper to a large amount. The latter firm will probably assign. Tilden & Cur-tis, Boston, selling agents of the company, have also failed.

also failed. -Great changes are pending in Canada--changes which will materially affect the future of this country and may seriously alter the re-lations between the United States and Canada. It is reported on the best authority that, at the conclusion of the present session of the Federal Legislature, the Government will appeal to the country on the annexation question. Sir John Macdonald, Premier, and the leader of the Government, will retire from public life and Sir Charles Tupper, present Canadian Commis-sioner in England, will assume the leadership of the Conservative party. -A serious fire occurred Thursday night in

-A serious fire occurred Thursday night in the military hospital in Madrid. There were 430 patients in the building and they were panic-stricken. Many of the patients were un-able to help themselves in any way, but the nurses and doctors bravely and successfully de-Attest

voted themselves to the task of removing them from the burning structure. The Governor of Madrid himself hurried to the scene and carried

Madrid himself hurried to the scene and carried several men, who were suffering from contagi-ons diseases, to the neighboring barracks. One wing of the hospital was totally destroyed. No deaths resulted from the fire. —The removal of duty in 1887 increased the importation of anthracite coal from the United States from 1.024,000 to 2.134,000 tons last year. In connection with the imports of coal from the United States, a large deputa-tion of Senators and members of Parliament have waited upon the Government in view of the Pennsylvania mines having been brought by recent railway connection within 640 miles, to urge the necessity of protecting the bitu-minous coal fields of Nova Scotia from Ameri-can competition by increasing the duty on bi-



ratus. The breech is out off at the cylinder and the hoop taken off. The gun is then bored out to a short distance forward of the trunnions. The rear part of this boring is somewhat larger than the forward end, and around the enlarged part is cut a coarse

proved December 23, 1885. Deposit required, \$5,000. Letting No. 2, 364. The district described as the northern district in ordinance number 14,607, ap-proved December 20, 1888. Bidders will state prices per annum at which are lights of 2,000-candle power each. or incandescent lights, of 30-candle power each. Will be furnished, operated and maintained, for lighting streets and public piaces: also prices per annum at which are lights, of 2,000-candle power each. will be furnished, operated and maintained, for lighting streets and public piaces: also prices per annum at which are lights, of 10-candle power each, or incandescent lights, of 10-candle power each, will be furnished, operated and maintained for lighting public build-ings. Everything required for the above electric light-ing shall be furnished and maintained by the con-tractor.

The contract with the city will carry the privil-ge of furnishing electricity for light and power to private partles and corporations along the oprivate partles and corporations along the lines of distributing electricity for light and power to private partles and corporations along the the City of St. Louis may acquire the entire cice-tric plant and appurtenances at the expiration of the City of St. Louis may acquire the entire cice-tric plant and appurtenances at the expiration of the City of St. Louis may acquire the entire cice-tric plant and appurtenances at the expiration of the contract. Bidders must submit with proposals, general and detailed plans and specifications of the pro-posed system of distributing the electricity, mode of supporting the lights and wires, and of safety appliance. Troposals must be made on blank forms and in-freesoure of the City of St. Louis that the sum of \$5,000 has been deposited in the treasury must be inclosed with the proposal. The reaster of the City of St. Louis, on and after Janu-ary 23, 489. Any contract lot hereunder will require the ap-porting the flapted, may be seen at the office of the President of the Board of Public Improve-ments of the City of St. Louis, on and after Janu-ary 23, 489. May contract lot hereunder will require the ap-porting the municipal Assembly by ordinance. HENRY FLAD, President.

HENRY FLAD,

EMORY S. FOSTER, Secretary. ja11-22

OFFICIAL-PITTSBURG.

DEPARTMENT OF PUBLIC WORKS, {

DEPARTMENT OF PUBLIC WORKS, PITTSBURG, Feb. I. 1889. NOTICE IS HEREBY GIVEN THAT THE reports of Viewers on the opening of Beeler street, from Wilkins avenue to Forbes avenue: Glenwood avenue, from Second avenue to Lot 38 in Plan of Upper Glenwood, and Dal-has avenue, from Irwin avenue to Forbes ave-nue, have been approved by Councils, which action will be final, unless an appeal is filed in the Court of Common Pleas within ten (10) days from date. E. M. BIGELOW, fe2-22 Chief of Department of Public Works.

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Connolisand Court, providing for the assessment and collection of damages and benefits, author-izing the use of private property and providing for filing liens and regulating proceedings thereon, and prohibiting the use of public streets without authority of Councils," ap-proved the 14th day of June, A. D. 1887. Section 2-That any orumance or part of ordi-nance conflicting with the provisions of this ordinance be and the same is hereby repealed so far as the same affects this ordinance. Ordained and enacted into a law in Councils this 21st day of January, A. D. 1889. H. P. FORD, President of Select Council. Attest: GEO. SHEPPARD, Clerk of Select Council. GEO. L HOLLIDAY, President of Common Council. Attest: GEO. BOOTH, Clerk of Common Council. Mayor's Office, January 22, 1899, Approved: WM. MCCALLIN, Mayor. Attest: W. H. MCCLEARY, Mayor's Clerk. Recorded in Ordinance Book, vol. 6, page 505, 6th day of February, A. D. 1889. fe7-16

Recorded in Ordinance Book, vol. 4, page 304, ed. day of February, A. D. 1889. fe7-16
In day of February, A. D. 1889. fe7-16
In day of Portage 20, ed. 10, ed

NORDINANCE-AUTHORIZING THE

INO. 212.1 A NORDINANCE-AUTHORIZING THE construction of a boardwalk on Craig street from Center avenue to Ridge street. Section 1-Be it ordained and emacted by the dity of Pittsburg, in Select and Common Coun-emacted by the authority of the same, That the ord is bereby authorized and directed to ad-pend is bereby authorized and directed to ad-wertise for proposals for the construction of a bereby authorized to let the same in the manner directed by an Act concerning streets, hereby authorized to let the same in the manner directed by an Act concerning streets, plements thereto and ordinances of Councils relative to the same. The cost and expenses of wordwalk on Craig street from Center avenue to Ridge street, and the Department of Awards is hereby authorized to let the same in the manner directed by an Act concerning streets, plements thereto and ordinances of Councils relative to the same. The cost and expenses of wordsnee with the provisions of an Act of As-sembly entilled "an act concerning streets and sembly entilled "an act concerning streets and youry 6, 1864, and the several supplements. Berton 2-That any ordinance, or part of or-

thereto. Section 2-That any ordinance, or part of or-dinance, conflicting with the provisions of this dinance, conflicting with the provisions of this ordinance be, and the same is hereby repealed to far as the same affects this ordinance

ordinance de, and the same is hereby repeated so far as the same affects this ordinance Ordained and enacted into a law in Councils this lith day of January, A. D. 1889. H. P. FORD, President of Select Council, Attest: GEO. SHEPPARD, Clerk of Select Council. GEO. L HOLLDAY, President of Common Council. Attest: GEO. BOOTH, Clerk of Common Council. Mayor's Office, January 17, 1889. Approved: WM. McCALLIN, Mayor. Attest: W. H. Mc-CLEARY, Mayor's Clerk. Recorded in Ordinance Book, vol. 6, page 563, 30th day of January, A. D. 1889. fe7-16

DEPARTMENT OF PUBLIC WORKS, PITTSBURG, Feb. 1, 1880, NOTICE IS HEREBY GIVEN THAT THE reports of Viewers on the construction NOTICE IS HEREBY GIVEN THAT THE reports of Viewers on the construction of severs on Nineteenth street. from Penn avenue to the Allegheny river: Linden and McPherson streets, from Edgerton avenue to Fifth avenue extension; Our alley from Stevenson street to Logan street; Westminster street, from Pit-cairn street to Lika sever and Likae street, from Westminster street to a point near Elmor street, have been approved by Councils, which action will be final, unless an appeal is filed in the Court of Common Pleas within ten (10) days from date. E. M. BIGELOW, fo2-22 Chief of Department of Public Works.

