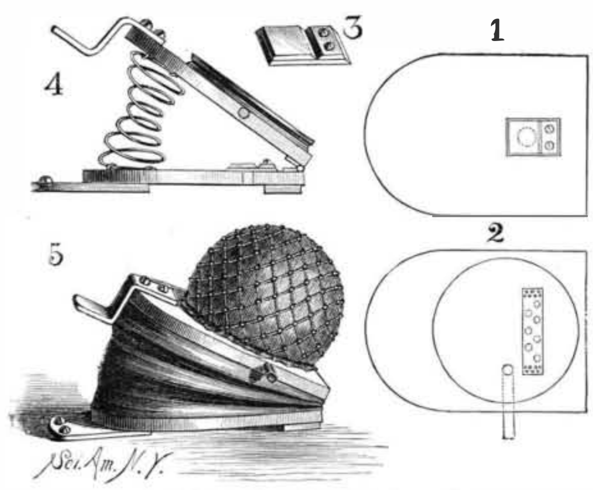
APPARATUS FOR SOLDERING AND MELTING.

BY GEO. M. HOPKINS.

No laboratory is complete without an efficient blowpipe and some means for operating it; and while it is, as a rule, advisable to purchase apparatus of this class rather than make it, a few hints on the construction of a bellows, a blowpipe, and a small furnace may not be out of place. The bellows and furnace are of the kind devised by Mr. Fletcher, and made by the Buffalo Dental Mfg. Co. The blowpipe differs in some respects from those furnished by the above-named house.

In the construction of the bellows the following ma-



Figs. 1 to 5.—BLOWPIPE BELLOWS.

terials are required: Two hardwood boards 10 × 11 inches and $\frac{7}{8}$ inch thick; one circular board 1 inch thick and 9 inches in diameter; one piece of heavy sheepskin 30 inches long, 7 inches wide at the middle, and tapering to two inches at the ends; two disks of elastic rubber, each 11 inches in diameter and $\frac{1}{32}$ inch thick; one small scoop net; 3 inches of $\frac{3}{8}$ brass tubing; 3 small hinges; a spiral bed spring, and two iron straps.

The 10 × 11 inch boards are rounded at the ends, as shown in Figs. 1 and 2, and their square ends are connected together by the hinges as shown in Fig. 4. A hole is made in the lower board near the hinged end and covered by the valve shown in Fig. 3. The valve consists of a soft piece of leather, having attached to it two wooden blocks, one of which is fastened to the board in position to hold the other in the position of use. These blocks are beveled so as to give the valve sufficient lift and at the same time limit its upward motion. The circular board has a groove turned in its edge, and in a hole formed in its edge is inserted the brass tube. A hole is bored into the top of the circular board, which communicates with the inner end of the brass tube, and a series of holes are made in the circular board, which also pass through the upper board of the bellows. Over these holes is placed a strip of soft, close-grained leather, which is secured by nailing at the ends. This leather strip forms the upper valve.

The bed spring is secured to the upper and lower boards, and the bellows is ready to receive its covering. The spring, the hinges, and the valves should be secured with great care, as they are inaccessible when the leather covering and the rubber disks are in place. The boards are closed together, reducing the space between them to about 5½ inches. They are held in this position in any convenient way until the cover is attached. The leather covering is glued, and tacked at frequent intervals. The leather is carried around the corner and over the hinged ends of the boards. An additional piece of leather is glued over the hinged end, and a narrow strip of leather is glued to the edges of the boards to cover the tacks and the edges of the leather covering. The job will be somewhat neater if the edges of the boards are rabbeted to receive the edge of the covering and the tacks.

The rubber disks are stretched over the circular board and secured by a strong cord tied over the rubber and in the groove in the edge of the board. The net is afterward secured in place in the same way. The net should be so loose as to allow the rubber, when inflated, to assume a hemispherical form, as shown in Fig. 5. A cleat is attached by screws to the hinged end of the lower board, and a straight iron strap is attached to the rounded end of the same board. The corresponding end of the upper board is provided with an offset strap, upon which the foot is placed when the bellows is used. The hole closed by the lower valve is covered by a piece of fine wire gauze tacked to the under surface of the lower board to prevent the entrance of lint and dust.

The blowpipe, which is connected with the brass tube of the bellows by means of a rubber pipe, is shown in section in the upper part of Fig. 6. It consists of two pipes attached to each other and adapted to receive the rubber pipe connections at one end. At the opposite end they are arranged concentrically, the aperture of the smaller pipe—which receives the air—being reduced 0·05 of an inch. The outer and larger pipe, which receives the gas, is provided with a sliding nozzle, by means of which the flow of gas can be easily controlled. The internal diameter of the smaller end of the nozzle is one-quarter inch. These dimensions are correct only for a blowpipe for small and medium work, *i. e.*, for brazing or soldering the average work done in the making of physical instruments; for melting two or three ounces of gold, silver, brass, and other metals, and for forging and tempering tools and small articles of steel, and for glass blowing on a small scale.

The gas is taken from an ordinary fixture by means of a rubber tube, the supply being regulated entirely by the movable nozzle of the blowpipe. The force of the blast varies with the manner in which the bellows is operated.

One of the best supports for articles to be brazed or soldered is a brick of pumice stone. It heats quickly, is very refractory, it admits of securing the work by tacks or nails driven into it. It has the further advantage of being incombustible. The work to be brazed or soldered must be well fitted, *i. e.*, there must be a

Fig. 7.—GRINDING BORAX.

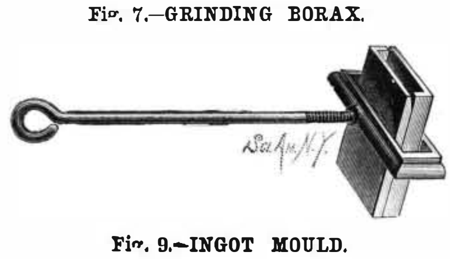


Fig. 9.—INGOT MOULD.

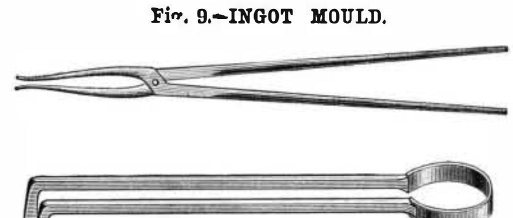


Fig. 10.—CRUCIBLE TONGS.

good contact between the abutting or overlapping edges, and the contact surfaces must be well painted with a cream formed by grinding borax with a few drops of water on a slate (Fig. 7). When necessary, the work may be held together by an iron binding wire. The solder is coated with the borax cream before it is applied to the joint. For most work silver solder is preferred, as it is very strong, being both ductile and malleable.

The work is heated gradually until the water of crystallization is driven from the borax, then the work is heated all over until the solder is on the point of melting, when a concentrated flame is applied to the joint until the solder flows. Care should be taken to use the reducing flame rather than the oxidizing flame. Should it be found difficult to confine the heat to the work, pieces of pumice stone may be placed around the part containing the joint, as shown in Fig. 6.

A large number of small articles may be easily and quickly soldered by placing them on a bed formed of small lumps of pumice stone and proceeding from one article to another in succession.

For supporting small work, having a number of

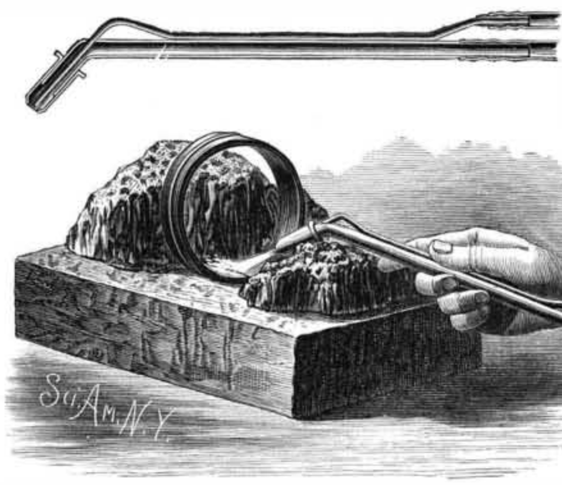


Fig. 6.—BRAZING.

joints and requiring much fastening, the slabs of asbestos are very desirable. For very small work to be done with the mouth blowpipe, the prepared blocks of willow charcoal are used.

After soldering the borax may be removed by boiling the article in sulphuric acid.

The small gas furnace shown in Fig. 8 may be used in connection with the blowpipe and bellows, already described, by arranging the blowpipe on a stand and placing the furnace upon the pumice stone brick or a fire brick. The blowpipe is adjusted to deliver a blast to the opening of the furnace. The crucible in which the metal is melted rests upon an elevation at the center of the furnace, as shown in the sectional view in Fig. 8. The crucible contains besides the metal a small quantity of borax for a flux. A roaring flame is required, and the blowpipe must be carefully adjusted with reference to the opening of the furnace to secure the best results. With this furnace and blowpipe two ounces of metal can be melted in ten minutes. Its capacity, however, is greater than that. After the metal is rendered sufficiently fluid it may be poured into an oiled ingot mould, shown in Fig. 9, thus giving it a form adapted to rolling or hammering, or it may be poured into a sand mould, giving it any desired form. The crucible is handled by means of the tongs shown in Fig. 10.

The body of the Fletcher furnace is formed of clay treated in a peculiar way to render it very light and porous. It is 4¼ inches in external diameter and 4¼ inches high. Its internal diameter at the top is 2¾ inches, at the bottom 2¼ inches. The hole at the side is ¾ inch in diameter. The cover, which is 1⅛ inches thick and of the same diameter as the body, is concaved on its under surface and provided with a ⅝ inch central aperture. The cover and the body are encircled by sheet iron.

It is not difficult to make a furnace which will compare favorably with the original article. Any tin or sheet iron can of the right size may be used as a casing for the furnace, provided it be seamed or riveted together. A quart wine bottle having a raised bottom serves as a pattern for the interior of the furnace. The upper portion of the raised bottom is filled in with plaster of Paris or cement to give the crucible support a level top. The material used in the formation of

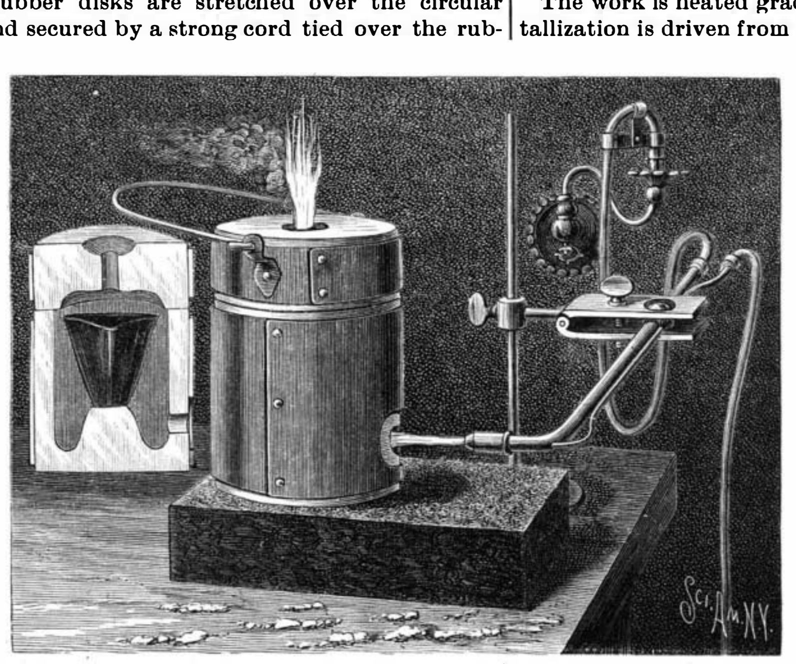


Fig. 8.—BLOWPIPE FURNACE.

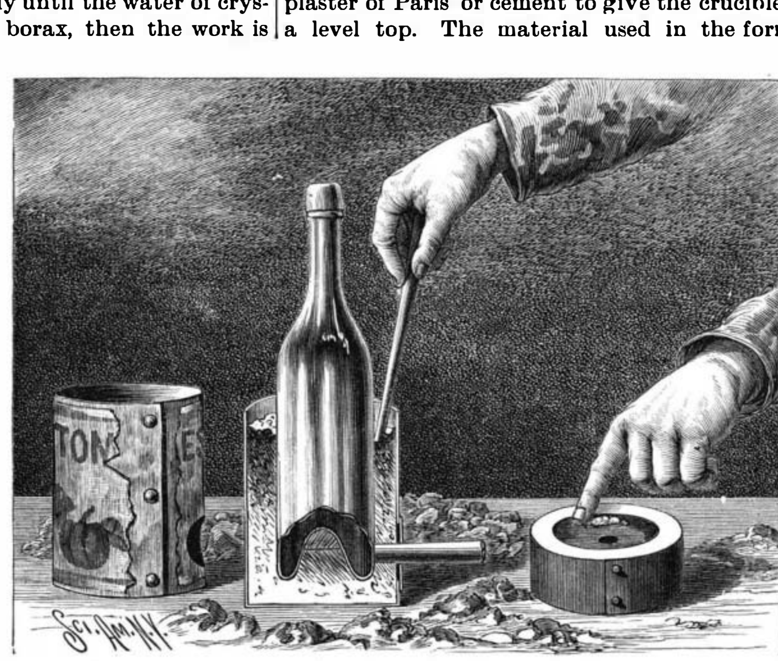


Fig. 11.—MAKING A BLOWPIPE FURNACE.

the furnace is clay of the quality used in the manufacture of fire bricks, or even common bricks, moistened and mixed with granulated fire brick. The material known as "stove fix," used in repairing the lining of stoves, answers very well when mixed with granulated fire brick or pumice stone.

The can is filled to the depth of an inch with the material. The chambered bottom of the wine bottle is oiled and filled with the material and placed in the can as shown in Fig. 11. A ¾ inch wooden plug is inserted in a hole in the side of the can, to be afterward withdrawn to form the blast aperture. The can is then filled with the clay mixture, which is tamped in lightly. The material should not be too wet, and it is well to oil the bottle to facilitate its removal. When the filling operation is complete, the bottle is loosened and withdrawn. The cover is formed by filling a suitable band with the clay mixture. The furnace is allowed to dry for a day or so. The first time the furnace is heated, the temperature should be increased very gradually.

Cure of Inebriates.

From the *Quarterly Journal of Inebriety*, published at Hartford, Conn., under the auspices of the American Association for the Study and Cure of Inebriates, we make the following extracts from a recent lecture by Dr. Elliott, at Toronto:

Four conditions must be observed. The first condition of cure and reformation is abstinence. The patient is being poisoned, and the poisoning must be stopped. Were it an arsenic instead of an alcohol, no one would dispute this. So long as the drinking of intoxicants is indulged in, so long will the bodily, mental, and moral mischief be intensified and made permanent. Abstinence must be absolute, and on no plea of fashion, of physic, or of religion ought the smallest quantity of an intoxicant be put to the lips of the alcoholic slave. Alcohol is a material chemical narcotic poison, and a mere sip has, even in the most solemn circumstances, been known to relight in the fiercest intensity the drink crave which for a long period of years had been dormant and unfelt. The second condition of cure is to ascertain the predisposing and exciting causes of inebriety, and to endeavor to remove these causes, which may lie in some remote or deep-seated physical ailment. The third condition of cure is to restore the physical and mental tone. This can be done by appropriate medical treatment, by fresh air and exercise, by nourishing and digestible food given to reconstruct healthy bodily tissue and brain cell, aided by intellectual, educational, and religious influences. Nowhere can these conditions of cure be so effectually carried out as in an asylum where the unfortunate victim of drink is placed in quarantine, treated with suitable remedies until the alcohol is removed from his system, then surrounded by Christian and elevating influences, fed with a nourishing and suitable diet, and supplied with skillful medical treatment. His brain and nervous system will then be gradually restored to its normal condition, and, after a period of from six to twelve months in most cases, he will be so far recovered as to be able to return to his usual avocation and successfully resist his craving for drink. The fourth condition of cure is employment. Idleness is the foster mother of drunkenness, industry the bulwark of temperance. Let the mind of the penitent inebriate be kept occupied by attention to regular work, and the task of reformation will be shorn of half its difficulty.

Age of Parents and Vitality of Children.

Mr. J. Korosi, director of the Hungarian Bureau of Statistics, recently read a memoir before the Hungarian Academy of Sciences upon the "Influence of the Age of Parents upon the Vitality of Children," and in which, taking 24,000 cases as a basis, he reaches the following conclusions:

Children whose father is less than 20 years of age have a weak constitution. The issue of fathers of between 25 and 40 years are the strongest, while the descendants of fathers of over 40 years are weak. The healthiest children are those whose mother has not yet reached 35 years. Those born of mothers of between 35 and 40 years of age are 8 per cent weaker, and those of mothers of over 40 are 10 per cent weaker. The children of aged fathers and younger mothers have, as a general thing, a strong constitution; but if the parents are of the same age, the children are less robust.—*Revue Scientifique.*

The Argentine Republic.

E. L. Baker, United States consul at Buenos Ayres, has in the Consular Report for February, 1889, a very interesting and lengthy report on the Argentine Republic, its products and resources, showing its importance to our business people as a market for our products. Referring to the newspapers received at the consulate, Mr. Baker mentions the SCIENTIFIC AMERICAN and others which he has placed at the disposal of merchants, shippers, etc., believing that they have been the source of great benefit to those interested in trade and commerce.

Correspondence.

Cement for Aquariums.

To the Editor of the Scientific American:

J. C. M. in Notes and Queries No. 634 says: "An aquarium of mine, made of marble and glass, leaks at the joints." I have a very large one, and have experimented with many cements and putties. I find the following perfectly satisfactory:

	By measure.
Whiting	6 parts.
Plaster of Paris	3 "
White beach sand	3 "
Litharge	3 "
Powdered resin	1 "
	16 parts.

Mix the ingredients together thoroughly, then make into a putty with the best coach varnish. Only enough to set one glass should be made up at once, as it soon becomes too hard to work. The glass should be thoroughly bedded in the putty and left about a week to harden. Cover the joints with two coats of asphaltum. Cover over on to the glass. This will stand water for an indefinite period, and if properly done, will not leak. HARRY S. WOODWORTH.

Rochester, N. Y.

Formation of Gas in Hot Water Pipes.

To the Editor of the Scientific American:

In regard to the article on the formation of gas in hot water and steam pipes, mentioned in your issues of March 30 and April 13, if no other conditions are present than those mentioned in the several cases, it would seem clear that the gas is hydrogen.

One of the common ways of making this gas in the laboratory is to pass steam through a hot iron pipe, the oxygen of the water (steam) uniting with the iron, forming iron oxide or iron rust, thus setting free the hydrogen. Whenever rusting, which is accompanied by heat, takes place *under water*, there is some hydrogen set free by the chemical action. The interior surface of cast iron is more or less rough, which would facilitate chemical action.

The entire surface exposed to the action of water or steam would be considerable, so that the total amount of gas which might form, though but a very little came from each square inch of iron, would in time form quite a volume of gas. This action would be more rapid in new pipes than in old ones, and also in case the pipes were very hot. CHAS. E. ADAMS,

Teacher of Science, State Normal School.

Salem, Mass., April 22, 1889.

The Gas Check for Heavy Ordnance.

To the Editor of the Scientific American:

I notice in your No. 13, March 30, SCIENTIFIC AMERICAN, in an article headed "War Material of American Designing," that credit is given to Colonel Broadwell for inventing the gas check now used by Krupp and others. I am in doubt about Broadwell being the original inventor of a gas check of this kind, viz., where a ring or its equivalent is inserted in the sliding block having a chamber behind it, into which the gas enters and forces the ring against the end of the barrel when the explosion takes place.

I recollect very distinctly in 1855 or 1856 being shown this improvement by Mr. Hezekiah Conant; the cause that prompted this improvement being the leakage of gas between the breech slide and the end of the barrel in the Sharpe rifle. Mr. Conant was at that time employed at the Sharpe's rifle factory, and he showed me his invention in a rifle, which we tested. It made a thoroughly tight joint, and was considered perfect. It was adapted and applied to all the Sharpe rifles made afterward up to the time the metallic cartridge was put into use. I feel quite sure that Mr. Conant was ahead of Broadwell in using the pressure of gas to close the joint between the sliding breech and end of barrel. Several years after this Broadwell's check was adopted in Germany in large guns, and the writer, when at the German armories in 1873, saw them being made at that time and gave them a history of the invention.

Of course the improvement is public property now, but I have felt since Broadwell came out with his patent that Mr. Conant was the man who should have the credit of the invention. "Honor to whom honor is due!" See Conant patent, April 1, 1856, No. 14,554.

F. A. PRATT.

Hartford, Conn., April, 1889.

[The use of expanding devices in breech-loaders to prevent escape of gas dates back of Mr. Conant's patent, and is so stated by Mr. Conant himself, for in his patent above cited, he refers to examples, namely, Green's patent, 1854, Day's patent, 1855, also Josylin's patent, 1855, in which, as Mr. Conant admits, gas rings are used. The construction and arrangement of Broadwell's device is very different from Conant's; and the latter, probably, would not be applicable to heavy cannon. There is nothing in Conant's patent that anticipates Broadwell's device or detracts from Broadwell's priority as the man who rendered possible the use of the heavy breech-loading ordnance of the present day. Broadwell's patent was not granted until September 21, 1875—more than nineteen years after Conant's—and up to the date of Broadwell's invention it can hardly be said that any one had produced a great gun that was really safe and reliable. Broadwell's rings are now in general use throughout the world.—ED. S. A.]

Calcined Oyster Shells for Cancer.

To the Editor of the Scientific American:

Your paper of June 4, 1887, contained an extract from the London *Lancet* relative to treatment of cancer with calcium carbonate. There being no physician here, I treated an Indian woman who had been afflicted with a cancerous tumor to my knowledge for over four years. A couple of months after using the remedy it commenced to improve. It is now so small that it can be said to be healed. I would advise any one having a cancerous tumor to use calcium carbonate as directed, and also think it well worth republishing.

W. H. WOODCOCK.

The following is the paragraph as published in the SCIENTIFIC AMERICAN of June 4, 1887.

CALCINED OYSTER SHELLS AS A REMEDY FOR CANCER.

In a recent number of the *Lancet*, Dr. Peter Hood, of London, refers to a communication of his published in the same journal nearly twenty years ago, on the value of calcium carbonate in the form of calcined oyster shells as a means of arresting the growth of cancerous tumors. In a case which he then reported, that of a lady nearly eighty years old, the growth sloughed away and left a healthy surface after a course of the remedy, as much as would lie on a shilling being taken once or twice a day in a little warm water or tea. He now reports another case of scirrhus of the breast, in the wife of a physician, in which the treatment was followed by an arrest of the growth and a cessation of the pain, the improvement having now lasted for years, and no recrudescence having thus far occurred. He urges that the remedy can do no harm, and that the *prima facie* evidence in its favor is stronger than that on which, at Dr. Clay's recommendation, the profession lately displayed an extraordinary eagerness to try Chian turpentine. He would restrict the trials to well marked cases of scirrhus, and insists that no benefit should be looked for in less than three months.

The Tannin Treatment of Phthisis.

Dr. E. Houze, of the Hospital St. Jean, Brussels, after having tried the tannin treatment on all his phthisical patients for the last year and eight months, states as the result of his observations that it gives excellent results in all stages of the disease, and especially in the condition where cavities exist. Indeed he has no hesitation in declaring that of all the different kinds of treatment for phthisis which he has tried this has given by far the most encouraging results. The dose he employs ordinarily is fifteen grains, which quantity is taken three times a day. It is, as a rule, well borne. Where this is not so, it is ordered to be taken with meals. After the first few days the expectoration and the sweats diminish, the cough decreases, and in many cases the appetite undergoes a marked improvement.

The majority of the patients suffered from some slight degree of constipation, though in some this feature was sufficiently marked to require treatment; while others, again, suffered from diarrhœa.

The character of the expectoration changed for the better, the sputa becoming white and frothy instead of green and firm. In some cases the diminution of the expectoration was followed by increased dryness of the cough, so that the patients complained that it fatigued them more. This was easily remedied by prescribing a few spoonfuls of sirup of codeia. The physical signs underwent a remarkable change for the better, at least those depending on auscultation, moist rales giving place to dry rhonchi, and large gurgling rales decreasing progressively until they gave place to mere blowing respiration. These changes were evidently due to the drying up of the cavities, in consequence of which the hectic present in many of the cases vanished, the patients increasing considerably in weight and gaining strength in a remarkable manner. The percussion signs were not found to undergo so marked a change as those dependent on auscultation, but even here some improvement could be detected. No bacteriological observations were made.—*Lancet.*

Dynamite Shells.

J. W. Graydon's invention has for its object to enable shells loaded with large quantities of dynamite to be fired from ordinary guns with the usual powder charge. The improvements consist mainly in subdividing the shell charge into a number of small portions or pellets, each consisting of a small quantity of dynamite inclosed in a flexible envelope of paraffined paper. A further subdivison of the charge may also be effected by means of partitions, perforated or otherwise. In order to prevent the dynamite from becoming fired by the heat generated by the explosion of the ordinary propelling powder charge in the gun, the shell charge is entirely surrounded by an envelope of non-conducting material, such as asbestos cloth.