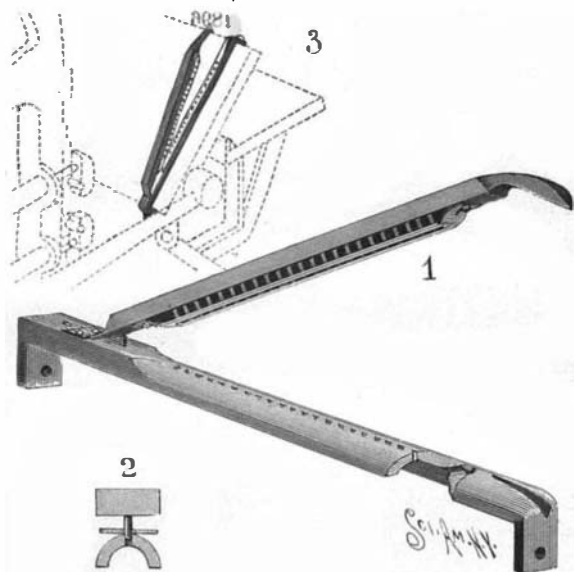


through the target and exploding on the other side, but the shrapnel is totally different. In the war head of this dangerous projectile are several rings of blind holes, reminding one of woodpecker's holes in a dead tree. Each one of these holes means $\frac{1}{4}$ second on the fuse that runs around the inside, and just before inserting in the gun, a tool resembling an awl is driven through one of these holes, puncturing the fuse at the desired point. It is aimed to explode the shell a short distance before reaching the mark, the explosion throwing the numerous bullets and fragments over a large area, spreading out in shape similar to a cone. The



PERFORATOR FOR PRINTING PRESSES.

time from the gun to the mark on this range was 7 seconds, and, when one's nerves are on a tension, waiting for the shell to explode, 7 seconds seems a very long period. As before stated, the winner on this range was the Second Battery, making 197 points, the Sixth gaining 185, and the First 41. The First Battery fired on June 15, the Second Battery on June 19, and the Sixth Battery on June 20. If the Second wins the "Trophy" next year it will close the contest, as they will then have been a winner three times.

We are indebted to Mr. G. E. Stonebridge, the author of the article, for the accompanying photographs.

THE HONE AUTOMATIC FLOOD-GATE.

When it is considered how many disasters are caused by the sudden overflowing of reservoirs and dams, it is not astonishing that inventors should have endeavored to devise some mechanical means which would automatically allow the surplus water to escape as soon as the level would rise above a certain height. The most recent contrivance of this nature is the invention of Mr. Henry Hone, of Chicago, Ill., who conceived his idea while in charge of one of the mountain-lakes of Colorado. Mr. Hone's apparatus presents many novel features of construction, among which may be mentioned the means provided for discharging the water near the bottom, without draining the dam.

In the dam-wall a casing is set, which is permanently closed at about its middle portion, leaving an open port below and a space above, which is normally closed by a door hinged to the partition. Secured to the hinged door are chains passing over idlers and secured to a valve sliding vertically in guides so as to close or open the port below the fixed partition. Together with the partition and the hinged door, the valve completely closes the breach of the dam in which the casing is set.

The hinged door is arranged above the normal level of the dam and is, therefore, closed ordinarily. When, however, the water rises above a certain height, the pressure forces the door down, causing the valve to be raised and the lower port to be opened, and allowing the surplus water rapidly to escape. As the level of the water falls, the door swings back, thus causing the valve to close the port. To prevent the door from being thrown so far forward that a return is impossible, a stop is provided which limits the upward movement of the valve.

It may happen that driftwood or other obstructions may not permit a return of the door, thus preventing the valve from closing the port, and allowing the dam to drain. The inventor, therefore, employs a box having an open top, but standing around the port so that all

water must pass over the box. Evidently the dam can never drain below the top wall of the box. Back pressure of the water is also prevented from hindering the gate in its action. In the rear of the tank a door is provided which can be easily drawn up to permit complete drainage whenever desired. To increase the stability of the gate as an integral part of the dam, a broad flange extends from the sides of the gate into the dam, and from the bottom of the gate into the foundation upon which the gate rests, to prevent any leakage. More extended information can be obtained from Mr. W. I. Reedy, of 91 Illinois Street, Chicago, Ill.

A PERFORATOR FOR PRINTING PRESSES.

In printing bank-checks and similar stationery the operations of printing and perforating have hitherto been performed separately, thereby consuming no little time and requiring considerable labor. A perforator has been invented by Mr. Gustavus A. Evans, of Nelson, British Columbia, by means of which the checks can be printed and perforated at one operation. Fig. 1 shows the device in perspective and Fig. 2 in cross-section. Fig. 3 is a reduced view of the perforator as applied to a press.

The device consists of two parts, a bed-piece and a punch-bar. The bed-piece is provided at its ends with lugs which are screwed to the top and bottom edges of the platen in the manner shown in Fig. 3. A series of holes in the top of the bed-piece open at their inner ends into a channel formed on the under side of the bed-piece (Fig. 2), which channel serves to receive the disks cut out of the paper, openings being provided which lead from the ends of the channel to the face of the bed-piece so that the disks can be discharged.

At its ends the punch-bar is provided with springs, the lower of which is screwed to the bed-piece, and the upper of which is formed with a V-shaped guide which is designed to engage a correspondingly-shaped recess in the bed-piece to insure correct perforations (Fig. 1). The lower spring normally holds the punch-bar in open position. On the under side of the punch-bar are punches designed to register with the apertures in the bed-piece when the impression is made. To release the paper a slotted bar, spring-secured at its ends and longitudinally movable, is mounted beneath the punch-bar.

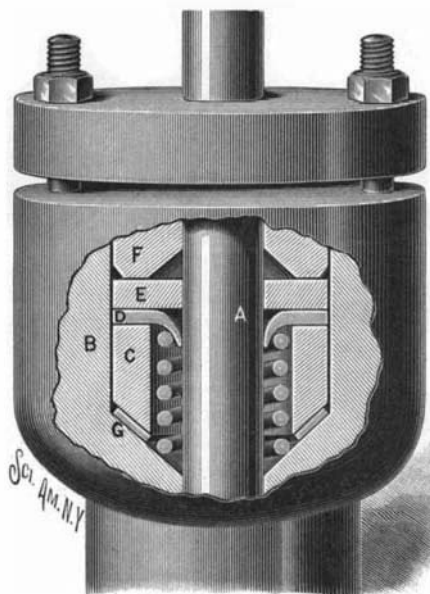
When the punch-bar moves into a closed position, then the paper-releaser moves in contact with the bed-piece, and is flattened out. As the paper extends over the face of the bed-piece, the releaser engages the paper at the closing of the plates and securely holds the paper in place during the perforation. When the platen opens, the punch-bar is also opened by the lower spring

previously mentioned, thus withdrawing the punches from the paper. The releaser then returns to its normal position, and in so doing cleans the punches.

The perforating device can be readily attached to the end of the platen, so that the face of the tympan can be brought almost level with the top face of the bed-piece, rendering it possible to print close to the perforations, if need be, without tearing the paper.

AN IMPROVED PACKING.

We present herewith an illustration of a novel packing invented by Wilbert Black, of 3917 Annunciation



A NEW PACKING.

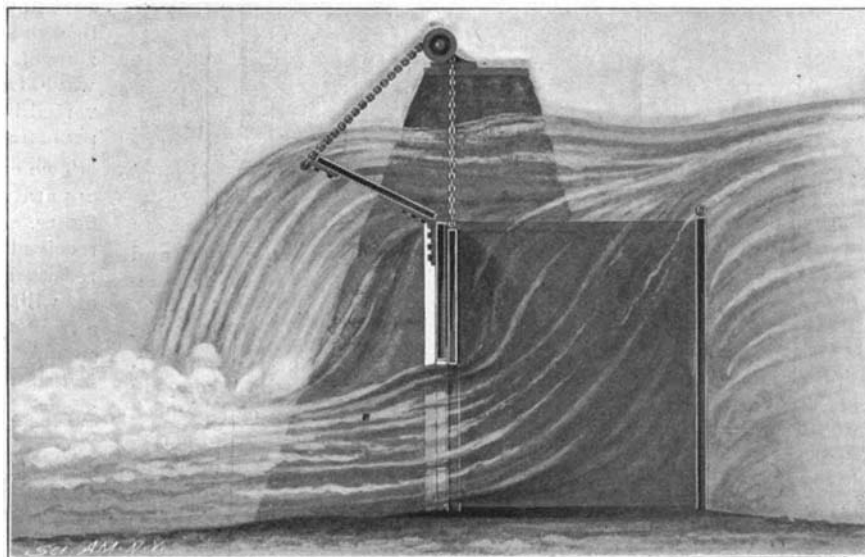
Street, New Orleans, La., which packing can be readily applied to the stuffing-boxes of hydraulic and other plunger pumps in order to prevent the passage of fluid in both directions.

The packing is here shown applied to a pump, the barrel of which has a box, B, to which a gland, F, is fitted. In the barrel a plunger, A, reciprocates. The box, B, contains a snugly-fitting thimble, C, which receives the plunger as well as an expansive spiral spring bearing on the bottom of the box, B. A leather washer, G, is interposed between the lower end of the thimble and the bottom of the box. The upper end of the thimble forms a seat for a leather packing-crimp, D, turned down and engaged by the upper end of the coiled spring. Upon the crimp, D, a ring, E, is set, which ring is held down by the gland, F, between the thimble, C, and ring, E; and the inner portion of the crimp is left free to accommodate itself to the movements of the plunger. On the compressing stroke of the plunger, the crimp, D, is forced outward against the plunger principally by the pressure developed within the barrel. On the return stroke of the plunger, the crimp, D, is forced by the spring against the plunger to prevent the entrance of air into the barrel during the outward movement of the piston, the air being partially exhausted within the barrel during the outward stroke.

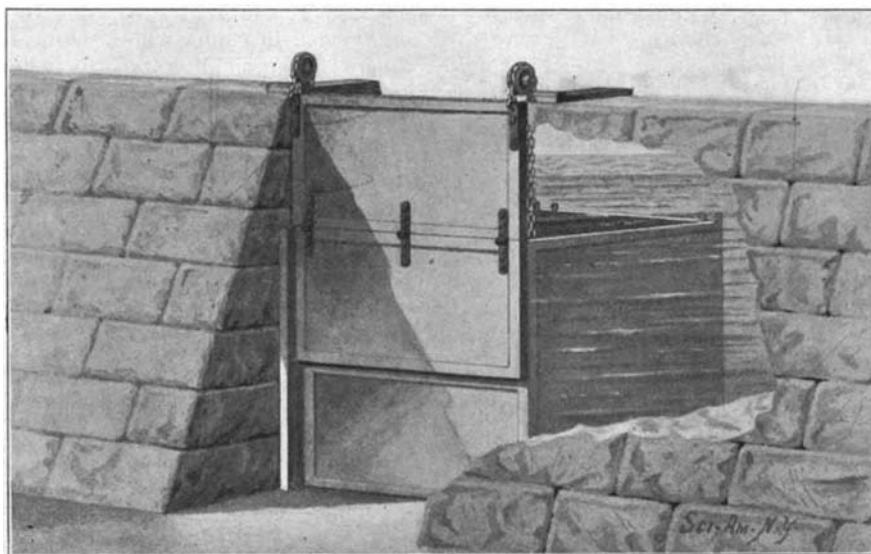
The Protection of Dynamite Magazines.

Trials have been made in France relative to the best method of building dynamite magazines. One was constructed to hold 1,100 pounds of dynamite. A gallery of communication 55 inches in height and width was bent twice like a hand brace and at the outlet ended in the safety automatic plugging device. This consisted, says *The Engineering and Mining Journal*, of a prolongation of the gallery through a mass of cement poured into an excavation made around it. In front of this channel the plug, which is of cylindrical shape, 48 inches in height and width, is placed. Two-thirds of its length is made of cardboard, or rather, leather board, and the remainder of wood. The contents were fired by electricity; a dull report was heard and after a few minutes smoke was observed to be issuing from the orifice, and the experiment was declared to be successful.

A SUCCESSFUL operation has just been performed in St. Luke's Hospital, New York City. A tumor was removed from the inside of the sheath of the spinal cord. It was necessary to cut into six vertebrae, and the patient was kept under anesthetics for more than three hours. He was operated upon after a number of German specialists had pronounced that his ailment was rheumatism.



GATE OPEN, SHOWING FLOW OF WATER.



GATE CLOSED, SHOWING RETAINING BOX.

Automobile News.

An automobile recently made the trip from Boston to Newport in two hundred and forty-seven minutes. The return was made by another route in less than three hours. The distance was 75 miles.

Automobile affairs are making progress in Spain, and a new automobile club is to be organized at Barcelona; for this purpose a preparatory committee has already assembled and a general meeting will shortly follow. A new automobile transportation company has recently been formed in Spain, under the name of Sociedad Automovil de Burgo de Osma, which intends to establish a service of automobile vehicles for transporting passengers and freight between Logrono, Soria, and Osma.

The International Congress of Automobilmism opened on the 9th of July in the Palais des Congrès, at the Exposition; the remaining sessions were held at the Automobile Club of France, in the Place de la Concorde. The programme before the Congress is divided into five sections: 1. Steam motors, explosion motors, and divers types. 2. Electric motors. 3. Transmission systems, frames and their organs, carriage building. 4. Traction force. 5. Economic questions, international and historic questions.

An automobile congress has been recently held at Padua, at which was decided the itinerary of the race called the "Tour of Italy," which is being organized on the same lines as the long touring race held in England. It will be held in April, 1901, and the distance covered will be 3,100 miles. A road race has been recently held at Padua, over a distance of 130 miles, with the following results: Tricycles: 1. Gasté, 4 h. 52 m. Quadricycles: 1. Bugatte, in 4 h. 44 m. Voiturettes: 1. Padovani, in 8 h. 13 m. Carriages under 880 pounds: 1. Frat, in 4 h. 39 m. Carriages above 880 pounds: 1. Colteletti, in 4 h. 52 min. The road race of 30 miles for motorcycles was won by Maseratti in 1 h. 23 m.

An important series of experiments with automobiles for use in the French army will take place in September at the great autumn maneuvers, near Chartres. At the maneuvers of last year experiments were made in this direction under the supervision of M. Journu, a well-known automobilist; as a result, Major Richard was appointed to select a type of automobile suitable for traction, but as the machine chosen was not satisfactory upon trial, the authorities decided to renew the experiment this year on a more extensive scale, with the assistance of private enterprise. For the military transport, eight machines will be used; of these, four have petroleum motors and four use steam. As in previous years, the service of the general staff will be performed by automobiles steered by the leading amateur conductors. General Jamont will use the machine of M. Brisson, of 12 horse power, and General Delanne that of M. Herault, of the same power; Girardot and Antony will conduct two of the other generals, each with a 24-horse power machine. M. Journu will have general supervision of the tests.

The official report relating to the tests of automobiles made at the Yorkshire Cycle and Motor Show, gives a number of interesting figures. Among the machines tested may be mentioned the steam automobile of J. Coulthard & Company, of Preston. It is a quadricycle, transporting a load of 2 tons, placed on a platform in the rear. The total length is about 14 feet, and width 6 feet; the wheels, in wrought iron, have 2'6 feet diameter in front and 2'7 feet in the rear, the tires being 4 and 5 inches wide respectively. The boiler is of the vertical type, tubular, having 9 square yards of heating surface and heated by petroleum; the safety valve is regulated at 30'8 pounds. The water reservoir has a capacity of 58 gallons and that of petroleum 23 gallons. The vertical engine is triple expansion, with three cylinders, the diameters being 2'8 inches, 4'6 and 6'1 inches, with a stroke of 5'1 inches. The motor is well balanced and of good construction; it makes normally 500 revolutions per minute. The boiler is fed by a pump or an injector at will; the escapement passes into a condenser of the Royle type, and the water of condensation is collected in a reservoir. The transmission from the main shaft to the axles is effected by toothed wheels and Renold chains. The total weight of the vehicle is 5,720 pounds complete. It is provided with three speeds having the ratio of 1,2 and 3.

The series of tests of motorcycles recently made at Vincennes Park is of interest as showing the performance in general and the consumption of petroleum of the latest types. The tests were carried out with care under a competent jury, and the points observed were, first, the regularity of running, necessity of repairs, etc.; second, consumption of gasoline; the speed was not taken into account. Twelve motorcycles entered the competition; five were tricycles, three quadricycles, and four bicycles operated by petroleum motor, this being mounted either in front or underneath the saddle. The latter did not give a remarkable showing, as only one was able to finish; but, however, with good results. In each of the classes, first and second prizes

were given, consisting of gold or silver medals. The following figures are given for the machine taking first prize in each class, and will thus show the performance of the most improved types. 1. Tricycles, constructor, Rochet; motor, De Don, vertical type, 3 inch bore and stroke, 1,800 to 2,000 revolutions per minute; weight of motorcycle, 266 pounds; consumption of gasoline, 5'8 gallons; distance, in each case, 480 miles; mean speed, 23'1 miles per hour. 2. Quadricycles, constructor, Rochet; motor, Aster vertical type, 3-inch bore and 3'4-inch stroke; weight of quadricycle, 400 pounds; consumption of gasoline, 8'4 gallons; mean speed, 20'2 miles per hour. 3. Bicycle, constructor, Werner; motor, Werner vertical type, with 2'1/2 inch bore and 2'3/8 inch stroke; weight of machine, 88 pounds; gasoline consumed, 6'7 gallons; mean speed, 24 miles per hour.

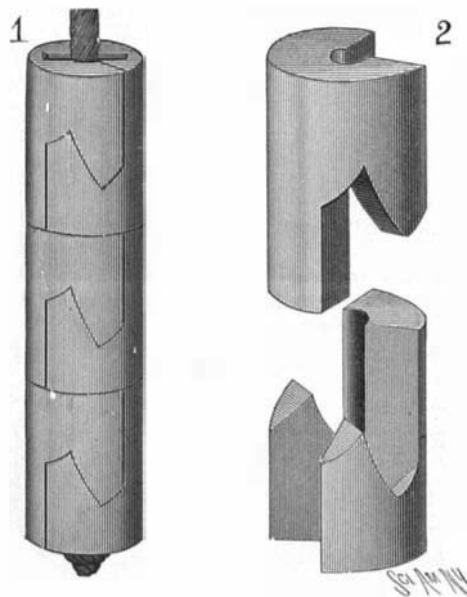
A CONVENIENT FORM OF SASH-WEIGHT.

The invention which forms the subject of the accompanying illustration is a new sash-weight patented by Eugene S. Crull, of Davenport, Iowa, which weight is made in sections so as to facilitate its adjustment on the sash. Fig. 1 is a perspective view of the device. Fig. 2 is a perspective view of the parts separated.

The two parts of which the weight is formed each consist of a body section with an open portion, and a branch, the branches fitting in the open portions of the bodies. Each part has also beveled flanking branches which interlock to sustain one part on the other. The parts have grooves which match to form a passage for the reception of the sash-cord.

It is evident that the number of weights can be increased or decreased at will to regulate the stress on the cord. When the proper number have been applied, the weights are held securely by a pin driven through the cord or a split washer clamping the cord and engaging the uppermost weight.

It is furthermore evident that this weight can be ap-

**NEW SASH-WEIGHT.**

plied to the cord at any point between the ends, and that it is not necessary to string the cord longitudinally through the passage in the weight.

One weight can be placed in position on top of another without disturbing the first weight. Merchants, by means of this invention, are enabled to carry in stock a uniform or standard article which can be used on different sashes. Hence the inconvenience of carrying in stock a large number of sash-weights of different sizes is obviated. The sections may also be used to build up the ordinary weight where the weight is inadequate properly to adjust the weight of sash.

Education in China.

Education of a certain type is very general, but still there are vast numbers of countrymen in China who can neither read nor write. There is a special literary class who alone know the literature of their country, to the study of which they devote their lives. There are boarding schools, day schools, and colleges. Examinations mainly confined to moral philosophy and literature are held in the prefectorial cities of each province twice in three years for the lower degree necessary as a passport to the public service, and of the six or seven thousand candidates who have come forward, not more than sixty can be admitted to the degree of Literary Chancellor. For the higher degrees, other examinations are necessary. There is a "College of Foreign Knowledge" at Peking, where European languages, mathematics, sciences, etc., are taught by European, Japanese, and American professors. There are besides many Christian mission schools, where the English language and lower branches of western sciences are taught. The government also maintains naval and military colleges and torpedo schools at the various arsenals to teach the young Chinese modern methods of warfare.

Electrical Notes.

An Italian electrician is said to have invented an electric cartridge for use as a substitute for dynamite, and other explosives. The composition used is made up of potassium carbonate and ammonium chloride, the proportions varying according to the use. The discharge is affected by the electric spark which produces an electrolytic effect upon the chemicals. The cartridges are said to be perfectly safe until subjected to the current.

The Baker Street (Waterloo) electric underground road, which is now being constructed in London, will probably be prolonged at its two extremities; instead of ending at Baker Street, it will go to Paddington Station, and at the other end will be prolonged from Waterloo to Elephant Place. When the line is completed, it is proposed to transport passengers over the entire length for four cents. To cover the same route by omnibus costs ten cents at present.

The use of electricity as an aid in agricultural pursuits has been tested on a considerable scale in Bavaria. The current is generated near the village of Schaftersheim, a distance of seven miles. The current is generated partly by steam power and partly by water power. The current is to be transmitted at a pressure of 5,000 volts to the surrounding villages, where it will be used for driving agricultural machines of various kinds. Special motors have been devised which can be easily operated by farm hands.

A new system of multiplex telegraphy has been devised by M. E. Mercadier, who has recently described the apparatus before the Société de Physique, of Paris. The transmitter is an electro-diapasm; the receiver is a telephone, and the relay is a differential telephone, which serves at the same time to receive all the signals sent by wave currents of different wave-lengths and to distribute them to the receiver circuits, containing twelve telephones constructed according to his system. The effect of the signals transmitted upon the receivers at the same end is neutralized by a combination of condensers and an artificial line. M. Mercadier gives an account of the practical results obtained by this system, which include the transmission of twenty-four messages at once over the same circuit from Paris to Bordeaux.

A new plan has been suggested by Mr. D. Tommasi for restricting the interception of wireless telegraphy messages. The idea is to use two transmitters of different ranges of action. The transmitter with the larger range is used for sending the message to the station for which it is intended, while the transmitter with the shorter range is employed in confusing the message within that range by an unmeaning series of dots and dashes. The range of a transmitter can fortunately be adjusted by altering the size of the spark gap, and, according to The Electrician, it should not be difficult to restrict the chances of interception to a zone of, say, half a mile. If, in addition, the spherical wave train could, by reflection or otherwise, be converted into a beam of the form of a search-light, the problem would be solved in a way.

Two engineers of Berlin have recently invented an apparatus which transmits to a distance the relief of a figure, either living or inanimate; the apparatus has received the name of "teleplastic." The relief may be received in full size, or may be enlarged or diminished at will, being quite exact. The transmitter consists of a frame containing a great number of metal rods placed side by side and movable back and forth. The receiver is a similar apparatus, in which the rods are moved by a series of electromagnets; when a relief is pressed against the rods of the transmitter a series of contacts is established, which cause the receiver to reproduce the relief by means of its rods, whose movement corresponds exactly to that of the transmitter. It is expected that this apparatus will render service especially in the pursuit of criminals, as it will give an exact reproduction of his features.

The lock gates at Ymuiden, Holland, are being operated by electricity. The rapid motion of the motor is converted into slow steady motion suitable for controlling heavy masses. Each gate is operated by means of a long connecting rod attached at about the middle of the width, the inner end of the rod being connected to a traveling carriage, to which motion is given by four endless chains passing from sets of sheaves. The train sheaves are operated by a train of gearing driven by the electric motor, the speed being reduced by a worm wheel and a pair of worms. The motor is placed in a separate chamber from the rest of the mechanism and is carefully cemented to prevent the access of moisture. The motor shaft passes through a fitted bearing in the wall, and there are three doors in the passage communicating with the chamber containing the operating gearing. The 145-horse power motors each control a gate, says The Engineering Magazine, and it is required that these shall open the gate in one and a half minutes against a difference of level of four inches. The motion being automatic is arrested at each end of the travel. The by-pass gates are also operated electrically, and the whole plant is under the control of a single operator.