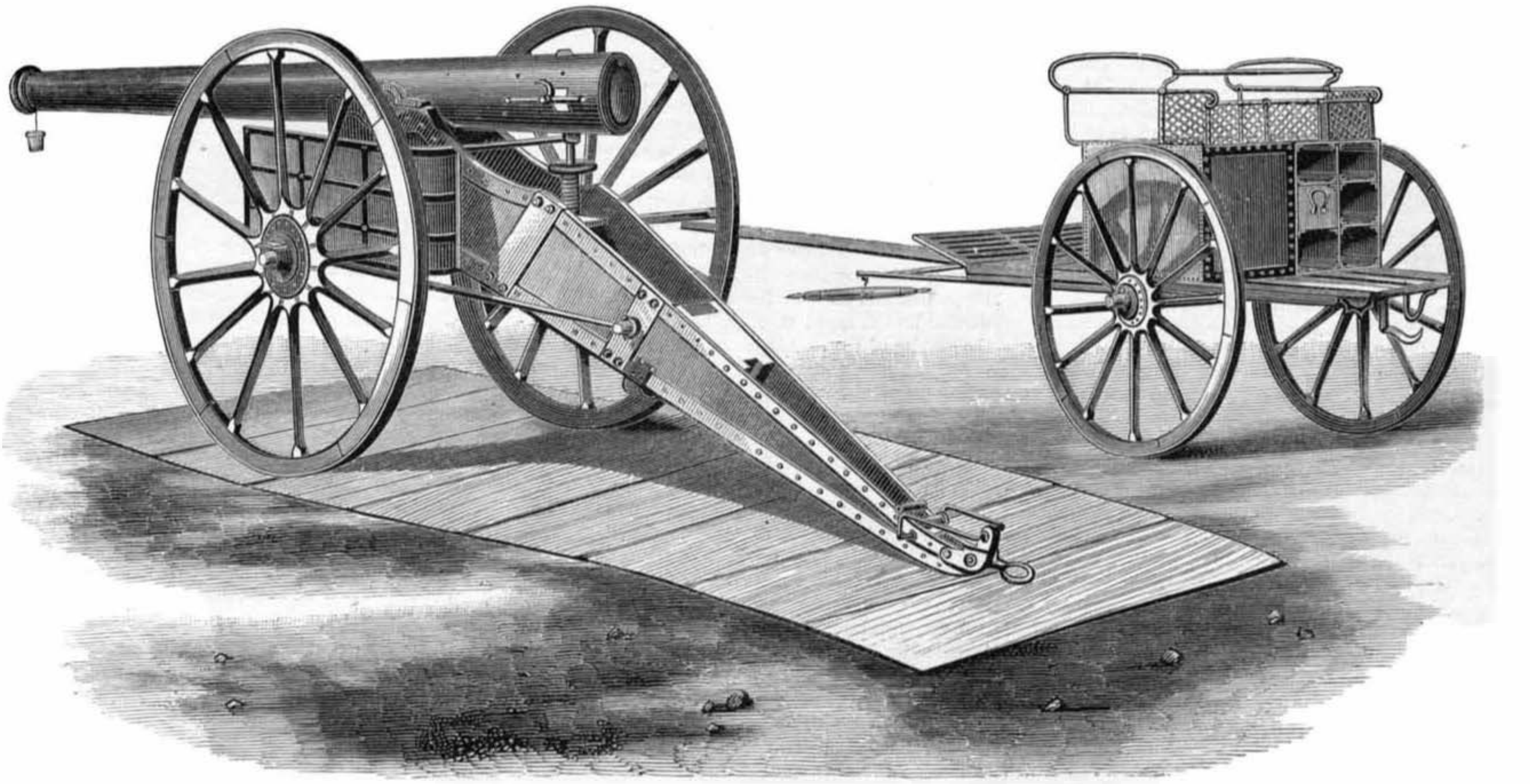
THE UCHATIUS BRONZE STEEL GUN.

The Uchatius bronze steel gun is cast by placing in the center of the cast iron mould a cylinder of copper, which, by absorbing part of the heat of the molten metal, causes rapid chilling of the central portion. Both the interior and exterior portions are thus formed of the same quality of metal. In five minutes the entire mass solidifies. It was, however, found that a deep recess was formed in the top of the casting, as shown in Fig. 1.

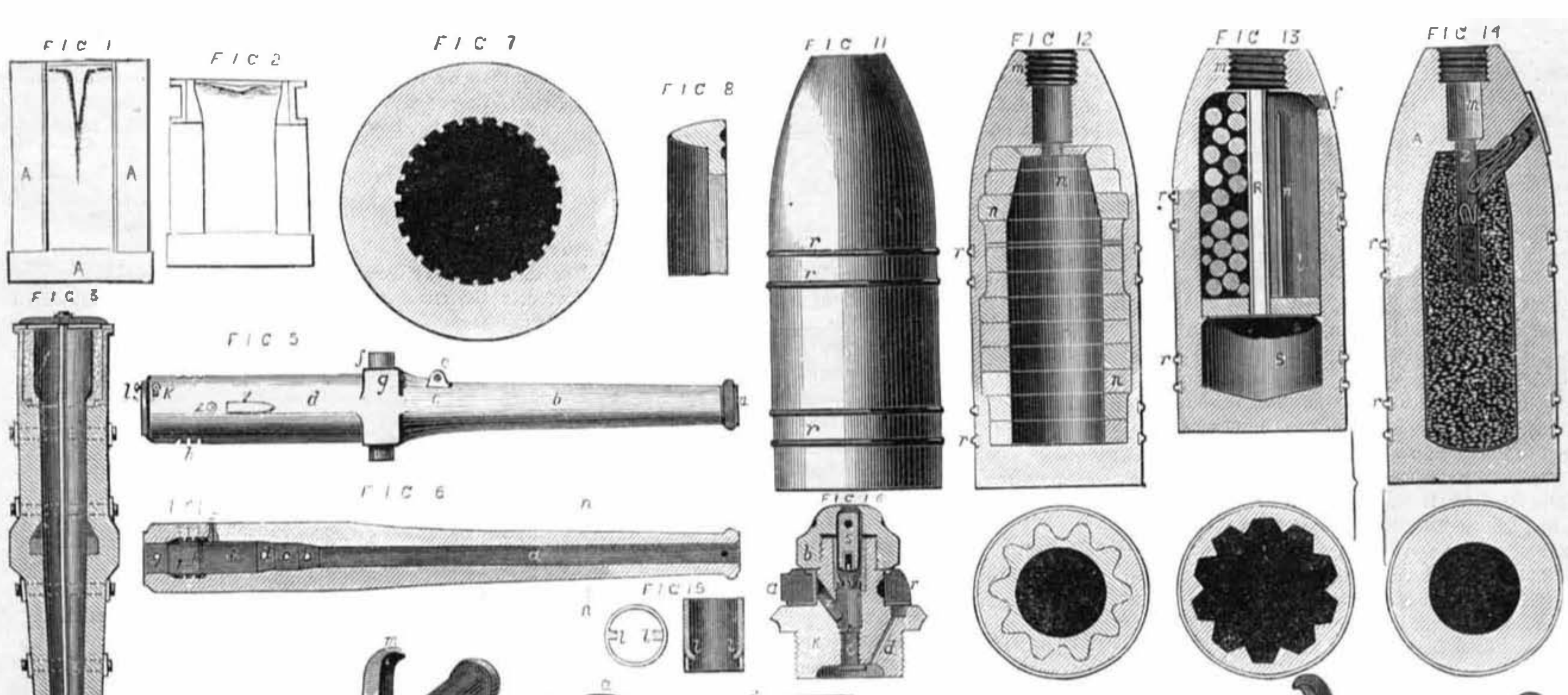


THE UCHATIUS BRONZE STEEL GUN.

General Uchatius met this difficulty by the addition of a sand mould, so as to form a dead head, in which the metal remained in the molten state for a comparatively long time, and so filled up any recess (Fig. 2). In Fig. 3 is shown the mould ready for casting a field gun with the interior copper cylinder. The core is eventually entirely removed by the boring bit. In a gun whose bore is about 3¼ inches, the bronze is compressed by the introduction in succession of six steel mandrils (c, Fig. 4), which are forced home by hydraulic pressure. The mandril is formed at the end in a truncated cone, so as to force the metal outwards and enlarge the bore, giving a calibre of 3½ inches. B, Fig. 4, represents an annular support on which the gun rests. Figs. 5 and 6 are the section and external forms of the gun, and the large cut shows both the gun and its limber.

The axis of the trunnions is in the same horizontal plane as that of the piece, and the trunnion arms themselves are hollowed out conically on the face. The piece is vented vertically a little in front of the breech-block slot. The latter is cut laterally near the breech and right through the piece. The gun is sighted at the right side with a small screw sight, screwed into a patch on the gun in front of the trunnions, and a tangent sight, R, at breech end of the piece. Looking at Fig. 6, we see that the bore, shot and powder chambers have different calibres, and that only the bore proper is rifled. A copper bush is screwed into the breech end of the powder chamber, for the reception of a copper Broadwell ring (Fig. 8). The breech block, Figs. 9 and 10, is also of bronze steel, and rectangular. Along the upper and under surfaces run a projection and deep groove, ensuring, together with the ribs, l, a perfect fit when the block is home. The loading cylinder, k, is dovetailed into the breech block, as shown, so as to be capable of movement forwards and backwards. To the left of the breech block is attached the arrangement for moving it. This consists of the plate, g, through which passes the spindle of the square-threaded screw, i, in Fig. 9, which carries the cross handle, K, which is itself secured by a catch, m. A slight pressure on the long arm, o, of the catch releases the nose, q, when the handle is free to move until it becomes horizontal, when the spring presses on the second nose, p, and secures the handle in a new position. As the thread of the screw is now withdrawn into the block, the latter can be moved outwards, towards the left, and when the loading is completed, the arm, o, is again pressed and the movements reversed, and so on.

The projectiles are of four kinds—common shell, shrapnel, carcase, and case. Rotation is given by means of four copper rings pressed into undercut rings around the projectile. The common shell, Figs. 11 and 12, is of the so-called double wall description, which has for its object to give as many splinters as possible of a size sufficient to kill a man. The inner wall is cast so as to consist of twelve horizontal and parallel rings, grooved longitudinally by deep lines of weakness. The fuze hole is separated from the interior by a diaphragm cast into the neck of the fuze hole. The shrapnel, Fig. 13, has the powder charge at the bottom, separated



THE UCHATIUS BRONZE STEEL GUN.

from the bullets by a thick diaphragm and ignited through a tube passing down the center of the shell from the fuze hole. The carcase, Fig. 14, is cast with very thick single walls, and its original head has three firewalls covered with pitch plaster. The interior is filled with a carcase composition, and a channel down the center, as well as other channels leading to the fuze holes, are filled with mealed powder, with quick-match leaders. The case consists of a zinc cylinder filled with bullets composed of lead and antimony, between which molten sulphur is run. Percussion and time fuzes, Figs. 15 and 16, are used. The gun carriage is made of thin Bessemer steel, strengthened with angle iron. The limbers of light and heavy guns are interchangeable. The heavy gun throws a common shell of 16.1 lb., and at 2,000 yards it has 40 feet more velocity than the 15·4 lb. shell of the Krupp gun. The light guns are, however, inferior to the Krupp guns of the same calibre. Krupp guns also cost three or four times as much. The Austrians are highly satisfied with their guns, which are considered quite equal, and probably a little superior, to the German Krupp steel guns of latest pattern. We are indebted to the *Engineer* for our illustrations.

Communications.

What the Telephone Heard.

To the Editor of the Scientific American:

A prominent drug firm having a store in each end of this city, being two miles apart, have recently established a telephonic connection, and have now in daily use a set of Bell's new telephones, which seem to work admirably. They are so well pleased with the new communicator that the old system of telegraphy heretofore in use has been entirely discarded. But the purpose of this note more especially is to inform you of the singular freak, or wonderful power and capacity of this little telephone, exhibited here a few weeks since. An accurate and experienced Morse sound reader chanced to be in the down-town store of the above firm, and while having the telephone to his ear heard what he thought to be the clicking of an instrument. He took pencil and paper and wrote what he heard, which proved to be a message from the Western Union office there, which was passing over their wires. He went immediately to that office and asked the operator if he had just sent the message which he then read to him from his telephonic notes. The Western Union man replied that he had, and could not possibly conceive how this gentleman had obtained it.

All the explanation that can be given in regard to this is that for a short distance both the telephone wire and those of the Western Union main line are strung on the same poles. Will Professor Bell explain to us this strange conduct of the child of his genius? This may not be the first instance of the kind, but I do not remember to have seen any record of the like before. H. HENDRICKS.

Kingston, N. Y.

A Brilliant Meteor.

To the Editor of the Scientific American:

Noticing the communication of Mr. Robert C. Hindley in your number for December 1, page 342, current volume, with the above caption, I turned to my journal to examine a memorandum made by me of a meteor seen about the same time. The entry in my journal and the account of Mr. Hindley agree so closely in everything except the date—mine being on the 12th, and his being on the 11th of November, that I am persuaded that we saw one and the same phenomenon, and that one or the other of us has mistaken the date. I transcribe my entry, which is as follows: "On leaving Mrs. S.'s this evening, as I came out the front door I was startled by a sudden glare of light, which seemed to come from right in front of me. Throwing up my eyes I saw a large and very brilliant meteor in the northeast, falling apparently near straight downward, with a slight deviation to the east. When I first saw the meteor it was about 30° in height and, judging from the length of time it took to traverse the remainder of its course, it must have already fallen three or four degrees. It fell through an arc of about 12° or 15° in all, and was about ten seconds falling. When I first saw it it had a golden hue, which suddenly changed to green of that peculiar shade produced by burning chlorate of potash with nitrate of barium and sulphur. The light shed by it was pulsating and sufficiently powerful to light up the Tennessee shore and the sand bars, so as to show every log and stump. On looking at my watch, I found that it was 36 minutes past 6 o'clock."

I do not write up my journal every night, and make entries only when something occurs which I wish to record: hence I may have made a mistake as to the date. The peculiar green hue of the meteor struck me as strange, and immediately suggested the green fire produced by pyrotechnists by a mixture of barium nitrate, potassium chlorate, and sulphur. FRANK L. JAMES, Ph.D., M.D.

Osceola, Ark., Nov. 26, 1877.

Blister Beetles: Correction.

To the Editor of the Scientific American:

The explanations to Figs. 1 and 2 in my blister beetle article in your issue for December 1, got transposed. Fig. 1 is that of *Meloe*; Fig. 2, that of *Sitaris*.

C. V. RILEY.

GLAZIERS' PUTTY: Whiting, 70 lbs.; boiled oil, 20 lbs. Mix, and add whiting or oil as needed.

New Inventions.

Mr. John W. Wallace, of New York city, is the inventor of a new Jack Clip or Thill Coupling, which is noiseless when in use and which enables the thill or pole to be readily attached or detached.

An ingenious combined Cane and Umbrella has been patented by Mr. Alexander Mungle, of Newark, N. J. There is a tubular umbrella stick into which the cane is inserted and retained by a hollow split handle, made of a fixed and hinged section, locked in suitable manner. The runner is locked to recessed or perforated catches of the stick by an axially turning spring sleeve. The arrangement seems to be simple, compact, and convenient.

A new Traction Wheel, patented by Mr. William Trenwick, of New York city, improves on the device patented by him December 3, 1872. The invention consists essentially of a movable web or center section supported on rollers or wheels arranged within a revolving traction wheel of larger diameter, the web supporting an axle made of two symmetrical sections, to one section of which suitable operating mechanism is applied. When traction is applied the position of the inner wheels is changed so as to throw their weight, together with the superincumbent weight of the vehicle and its load forward or backward of a perpendicular line dropped through the axes of the axle, so that the gravity of the load is utilized in moving the vehicle.

A new Truss, designed for supporting abdominal hernia, which may be securely held to the body without liability of becoming displaced or causing irritation, has been patented by Mr. Barak T. Nichols, of Hastings-on-the-Hudson, N. Y.

Messrs. Luther Jones and James Stroud, of New York city, have devised a new Sash Fastener, which consists in a curved spring plate, secured at one end to the edge of the sash, and having lugs formed upon the side edges of its other end, overlapping the sides of the sash. The ends of a roller are so pivoted that its sides may project through a slot in the said spring plate to bear against the casing.

A very handsome and ornamental Glass Panel has been invented by Mr. George Bassett, of Chicago, Ill. It consists of pieces of plain, ground, or colored glass, interposed between face layers of ornamentally cut-out wood.

Mr. Adolph Merkt, of New York city, is the inventor of an ingenious Leaf Turner for music. It consists of a slotted guide casing secured to the piano or music stand, and having a reciprocating rack bar with hinged fingers, worked by suitable mechanism either by pedals or a front button, in connection with an angular projecting center portion of the slot. The guide casing has a hinged front portion that may be opened to swing the fingers into horizontal position for arranging them in the leaves of the music.

PRODUCING CUTTING EDGES FOR TOOLS AND INSTRUMENTS.

BY JOSHUA ROSE, M.E.

No mechanical operation can appear to be more simple than that of grinding a tool to a cutting edge, and hence it is that very few persons have any idea of the large amount of knowledge as well as the skill that may be displayed in simply sharpening a tool. In the first place, to give a tool a suitable cutting edge, one must thoroughly understand the nature of the material to be cut, and must have had some experience in cutting it so as to know what variation to make in the tool to suit the variations in texture, closeness of grain, hardness, etc., which are always to be found in different specimens of the same material.

A cutting edge is formed by the line of junction of the two facets at the point of a wedge. The angle of these two facets one to the other, determined by considerations of strength, and the shape of each facet is determined either by considerations of strength or of shape. As a rule the harder the material to be cut, the more the approach of the two facets to a right angle, one with the other; and so likewise the greater the strength required, the nearer the facets to a right angle. Thus, while the facets of a graver may stand at an angle of 50°, those of the cutters for a pair of shears or a punching machine will stand at an angle of about 85°, though both may be used to cut iron and steel. In this latter case, the strength being the main consideration, it must be obtained at a sacrifice of keenness, whereas, if we take the case of a razor or a lance, sharpness is the main consideration, and strength is disregarded. There are, however, certain considerations in the production of the cutting edge itself, regardless of the angles of the facet, which affect all cutting edges, and these considerations it is which we propose to discuss.

First, then, comes the question as to on which side of a stone a tool should be ground, and this depends upon the shape of the tool, the amount of metal requiring to be ground off, and the condition of the grindstone. If the tool is held in such a position that the revolving surface of the stone runs towards the operator, the operation can be performed quicker, and as a rule better; but it is in many cases quite dangerous, because the edge of the tool is liable to catch in any soft part or a spot in the stone and to be dragged from the fingers, carrying them with violence down to the rest (every grindstone should be provided with a rest) and rendering them very liable to injury by being caught between the rest and the stone. In determining upon which side of the stone any given tool should be ground, the workman takes into consideration the following: the shape of the tool, the amount of metal requiring to be ground off, and the condition of the grindstone.

Upon the edge of a tool which last receives the action of the stone, there is always formed what is termed a feather edge, that is to say, the metal at the edge does not separate from the body of the metal, but clings thereto in the form of a fine ragged web, as shown in Fig. 1, in which A represents a grindstone running in the direction of the arrow, B, and C represents a tool. If now we take a point on the circumference of the stone, as say at F, it should leave contact with the tool at the point of the tool denoted by D; instead of doing this, however, the metal at the extreme edge gives way to the pressure and does not grind off, but clings to the tool, leaving a web, as shown from D to E; whereas, if the same tool were held in the position shown at G, the point, F, upon the stone would meet the tool at the edge first, and would cut the metal clear away and not leave a feather edge. Now the amount of the feather edge will be greater as the facets forming the edge stand at a greater angle one to another, so that, were the facets at a right angle, instead of forming an acute wedge, as shown in Fig. 1, the feather edge would be very short indeed. But in all cases the feather edge is greater upon soft than upon hard metal, and is also greater in proportion as the tool is pressed more firmly to the stone; hence the workman conforms the amount of the pressure to suit the requirements by making it the greatest during the early grinding stage when the object is to grind away the surplus metal, and the least during the later part of the process, when finishing the cutting edge, and hence he obtains a sharper tool, because whatever feather edge there may be breaks off so soon as the tool is placed under cutting duty, leaving a flat place along the edge. It would seem, then, that faces which can be ground in the position, relative to the stone, shown in Fig. 1, and upon a tool of shape similar to that shown in the figure, should always be ground with the stone running toward the cutting edge, as shown in Fig. 1, at the position denoted by G; and so they should, providing that the stone runs very true and contains no soft or hard spots of sufficient prominence to cause the cutting edge to catch, which would render the operation dangerous. These unfavorable conditions, however, are always more or less existent, under average conditions and to such an extent as to forbid the holding of the tool to the stone with the amount of pressure necessary to remove a quantity of metal, as is necessary in the earlier stages of the grinding operation. Furthermore, if the edge of the tool does catch in the stone, the damage to that edge is very serious and entails a great deal of extra grinding to repair it, and at the same time incurs a rapid using-up of the tool. Another consideration is that it is much easier to hold the tool steady, under ordinary circumstances, in the position shown at H, than in that shown at G; and with a bad stone it is altogether impracticable to hold it as at G. Here, however, another consideration occurs, in that the surface of a grindstone is rarely level across the width of the perimeter of the stone, unless the stone has a truing device attached to the frame, which at present is very largely the exception. As a rule the face of the stone is made rounding in its width because there is the most wear in the middle, and it is very undesirable to have the stone hollow across. Suppose, for example that in Fig. 2 we have a stone that is hollow, and in Fig. 3 one that is rounding across the perimeter; then to grind such a tool as is shown in Fig. 1, as say a plane blade, we may move it slowly across the width of the stone, and the highest part of the stone will act upon all parts in the width of the blade: but we cannot, by any method, grind such a tool upon the hollow stone without leaving the cutting edge rounding in its length.

So far, however, we have supposed the stone to have an even surface; but very often this is not the case, and then the operator, no matter which side of the stone he is using, holds the length of the cutting edge of the tool at an angle to the width of the stone, as shown in Fig. 4, placing the tool in the most level part of the grindstone surface. By doing this he effects two objects: first, he obtains a level spot upon the stone more readily, and secondly, he diminishes the formation of a feather edge. The first is because it follows that, in removing a given amount of metal, there will be more abrasion upon the stone in proportion as the operating area of the stone is diminished, hence the workman selects the highest part of the stone whereon he can find a suitable surface, and by moving the tool across the face wears down the asperities while he is roughing out the tool so as to obtain as smooth a surface as possible for finishing process. If he held the tool still instead of giving it lateral motion, it would grind away in undulations or grooves conforming themselves to those on the abrading surface of the stone and have but very little tendency or effect in leveling the same. Referring now to the second advantage named, it will be readily observed that, if he held the length of the cutting edge in a line with the revolutions of the stone, there would be no tendency to leave a feather edge, except at the corner of the edge where the stone leaves contact with the tool, and this would be of little or no consequence. The question naturally arises, then, why not grind the tool in that position, that is in the position relative to the stone shown in Fig. 5, which would require a very small flat or smooth space in the width of the stone and would avoid the formation of a feather edge. The answer to this is that it is so difficult to grind the surface of the tool level, as will be seen in the side view of the operation as shown in Fig. 6, in which A represents the tool enlarged so as to make the engraving clear, and from B to C, the length of the cutting edge. To bring the whole length of the cutting edge to bear upon the stone it is necessary to move the tool from C