THE NEW VICKERS-MAXIM AUTOMATIC RIFLE-CALIBER GUN.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The attention of European naval and military authorities has recently been centered in the new automatic rifle-caliber gun that has been designed by Messrs. Vickers, Sons & Maxim, Limited, and by whose courtesy we are enabled to describe and illustrate the many important improvements that have been embodied in this arm. It will be seen that fundamentally the principle and design are the same as the famous light Maxim gun, the main difference being that a reduction of 33 per cent in the weight of the weapon has been effected by the extensive utilization of high-class steel and aluminium, as a substitute for the gun metal hitherto employed. Moreover, a great improvement in the firing accuracy has been insured by means of a new-pattern muzzle attachment, the purpose of which practically eliminates the accumulation of fouling, and enables the gun to be fired continuously without losing any time in cleaning out the barrel, as is essential in the original weapon.

The water jacket is made of thin corrugated steel tubing, whereby great girder strength combined with lightness is procured, in addition to the provision of a larger cooling area. The trunnion block is made of steel, and has the advantage of being much lighter in weight; while the same fact applies to the end cap. The feed and handle block are made of high-class aluminium alloy with the working parts of steel as in the original gun. The trigger bar is made of steel, and is of a much improved pattern, making it impossible for any debris to remain in front of the hand sear, so that it is absolutely impossible for the gun to be fired accidentally without actually pressing the trigger lever.

The gun is entirely automatic in its action, and is fed automatically with cartridges from a belt, and the firing being controlled at will by means of pressure applied to the trigger lever at the rear. The weapon consists of two essential features—the recoiling and the non-recoiling parts. The automatic operation is insured by two forces—the explosion of the charge, which forces the recoiling portion backward, and a strong spring known as the fuzee spring, which carries it forward.

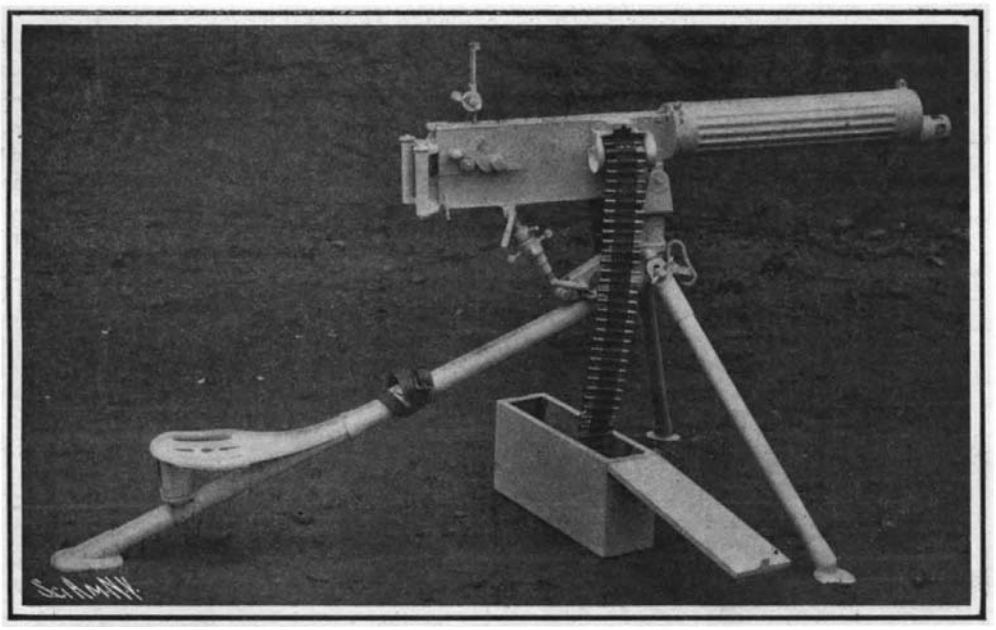
The recoiling portion includes the barrel and the firing mechanism, which move to and fro upon guides attached to the frame, the requisite motion being imparted by the recoil, the energy of which is stored up and regulated by means of the fuzee spring. The functions of the mechanism or lock are to receive the live cartridge from the belt, introduce it into the chamber of the gun, fire it, and then eject the empty shell.

The side levers are so constructed that when the lock is assembled, they cover the axis pins for the tumbler and hand sear, so that they cannot be shaken out. The advantage of this arrangement is that the necessity for securing the pins with wire is overcome. The side levers are not pivoted on studs to the sides of the frame, but are secured on an axis pin which passes through the frame and the longitudinal slot in the firing pin. There is a bayonet joint for attaching the side levers to the connecting rod, while an adjusting nut is placed on this connecting rod, so that the distance between the face of the extractor and the barrel may be adjusted.

The extractor levers, by means of a connecting pin, form one single piece, and are supported by bearings at the bottom on the lock frame. These levers support the extractor during the whole period of action, and at the same time limit its downward motion. The main spring is simply held in position by a recess formed in the lock frame without the aid of a pin. The extractor itself is only slightly different from that in the original gun, the lower lugs of the lever having been removed and the tail spring dovetailed in.

The recoiling parts are mounted inside the non-recoiling section, and are comprised of the barrel, the two recoil plates which carry the lock, and the crank. In order to protect the barrel, which is made of high tensile steel, from rust, it is coated with copper. The breech end is formed in the shape of a block having a stud on either side, called the barrel trunnion, and by means of which the barrel is attached to the recoil plates.

The crank is fitted on the right with a handle, the lower surface of which bears on the roller and is of special curved form. It is fitted with a fuzee, to which are attached two links which connect it to the fuzee spring, the remainder of the crank being within the breech casing. The action of the recoil causes



NEW VICKERS-MAXIM AUTOMATIC RIFLE-CALIBER GUN.

the fuzee spring to extend and wind the links, which are attached to it, about the fuzee, so that when the crank handle is immediately forward, the fuzee spring is not only extended about one inch by the recoil of the barrel, but is further extended by the winding of the links on the fuzee. Immediately the recoil action is expended, the fuzee spring pulls the recoiling portion back into the firing position. This movement unwinds the links from the fuzee, so that the crank handle flies back and strikes the check lever, which is so constructed that, when the crank handle reaches the stop, it is prevented from rebounding.

The non-recoiling portion comprises the frame and outer casing, including the water jacket which surrounds the barrel. The jacket is made of steel, and holds about seven pints of water for cooling the barrel during firing, being fitted with a valve to permit the steam thus generated to escape. The ejector tube is placed under the water jacket, and being fitted with a spring, prevents the shells from falling back into the gun during firing. When the jacket is filled with water, about 2,000 rounds may be fired at short intervals without replenishing the water supply. At the maximum firing capacity, the water commences to boil after about 700 rounds have been discharged.

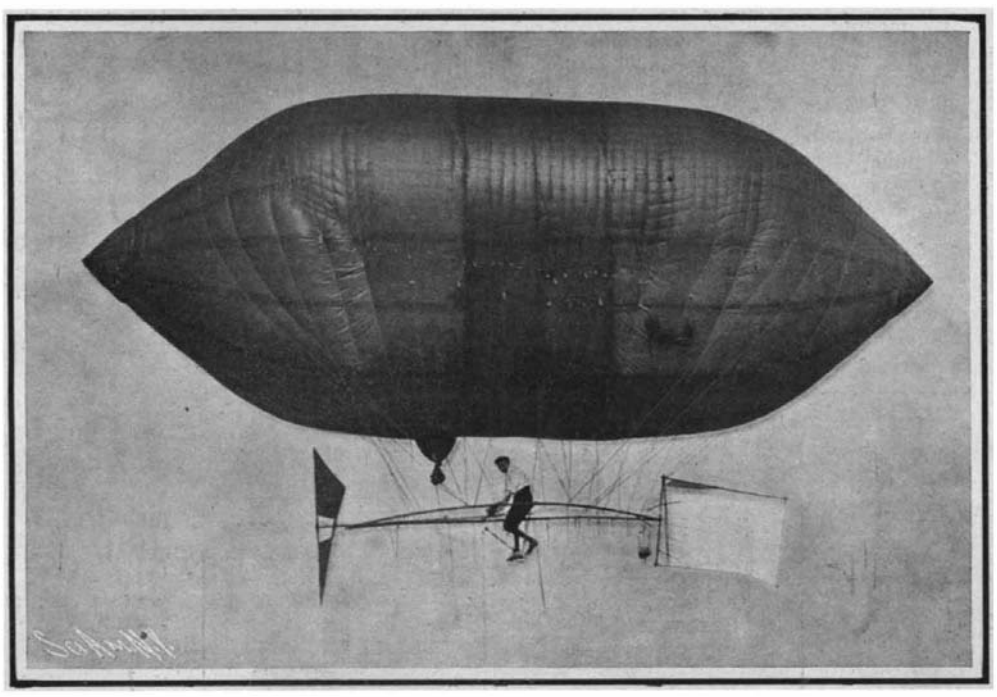
The gun is supplied with cartridges from a belt placed in an ammunition box on the right-hand side of the gun. The loaded belt is introduced into the gun by means of the feed-block, and as it passes through the cartridges are withdrawn by the action of the mechanism. On the top of the feed-block is a slide, which is made to move laterally by means of the cranked lever. Two pawls are fitted to this slide, held up by a spring. At each forward movement of the barrel these pawls push the belt one step to the left, placing a cartridge in position ready to be gripped by the extractor. On the under side of the feed-block are two retaining pawls actuated by a spring, which prevent the belt from slipping back; however, these pawls can be released by hand if it is necessary to withdraw the belt.

The muzzle attachment, which constitutes a prominent feature of this weapon, rendering greater accuracy in firing, consists of a disk clamped to the muzzle of the barrel, and a perforated sleeve which is connected to the barrel gland by a kind of bayonet joint, comprising a series of segmental lugs, which enables the sleeve to be rapidly and easily removed. The front part of the sleeve is concave, and the disk is cup-shaped, coming almost up to the front part of the sleeve when the barrel is fully home. In firing, the gases escaping from the muzzle are deflected by the cup-shaped disk, forcing the barrel to the rear after each discharge, and eliminating to a great extent much of the fouling accumulation.

The action of the gun is as follows: The gun is loaded, i. e. one cartridge is in the barrel, and another is in the belt in the feed-block immediately over the cartridge chamber. By pressing the trigger lever, the cartridge in the barrel is fired, and through the explosion the recoiling portion moves backward, the crank is rotated sufficiently to extract the empty case from the barrel, and a fresh cartridge from the belt fed into the feed-block. During the backward movement of the mechanism, the extractor drops down, bringing the cartridge in line with the chamber and the empty shell in line with the ejecting tube. The rotation of the crank unlocks the breech, draws the mechanism away from the barrel, and cocks the main spring. The mechanism returns, pushing a fresh cartridge into the barrel and the empty shell into the ejecting tube. Then, when the breech is closed, the extractor is moved upward, its grooves engaging with the next cartridge in the belt, and leaves the empty shell in the ejecting tube. By simply pressing the trigger lever, the gun will fire as long as any cartridges remain in the belt.

By the substitution of gun metal by aluminium and high-class steel, the weight of this weapon has been reduced to 40.5 pounds, whereas the standard automatic rifle-caliber Maxim gun weighs 60 pounds, representing a saving in weight of 19.5 pounds.

For use with this gun, a light tripod has been designed, the weights of all the component parts having been kept as low as possible consistent with stability during firing. Steel tubing is used for the front legs, there being at the upper end of each a longitudinal slot for attachment to the stud on the pivot, while a spiked shoe at the lower end prevents it from digging into the ground. When folded up, the front legs of the tripod lie alongside the rear leg, and are secured together with a strap. The rear leg is also a steel tube, the top end fitting into a socket at the rear of the pivot, with the lower end carrying a flat shoe to prevent it from sinking into the ground. There is a bracket and a collar on this rear leg for attaching the seat. The latter slips into the collar, and is secured to the seat bracket by two bolts. Thin steel plate is used for the seat, flanged and pressed into shape. To facilitate carrying the tripod, there is a longitudinal slot cut out at each side to form handles. Extensive trials with this mounting have shown, that notwithstanding its light weight, 29.5 pounds, as compared with the weight of the former type of tripod —49 pounds—great steadiness is obtained during firing. The appreciable economy that has been effected in the complete weight of this new weapon, which is only 70 pounds as compared with the 109 pounds of the standard service arm, insures greater mobility, and renders it highly serviceable both for naval and military operations.



THE "SKY CYCLE" BUILT AND NAVIGATED BY A FIFTEEN-YEAR-OLD BOY.

A HOME-MADE AIRSHIP.

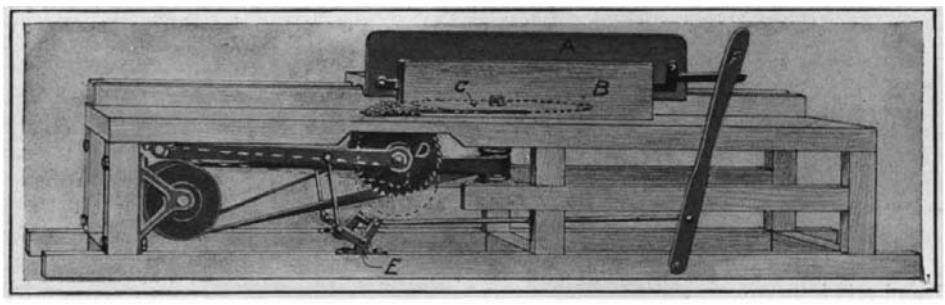
BY H. G. MOORE.

Inspired by the aeronautic exhibition at the St. Louis Exposition, Cromwell Dixon, a 15-year-old lad

of Columbus, Ohio, resolved to make some experiments along this line himself. With his mother's aid alone, he designed and built two airships, the last a slight improvement over the first. The boy's mother believed him too young to attempt to fly with a powerful motor, and he began on the idea of a foot-power machine. He calls it a "sky cycle." He secured a silk gas bag having much the form of a huge lemon, 32 feet long and 15 feet through. For this he designed and personally made a 4-inch mesh net. The bag he fills with hydrogen gas produced with home-made generators. Taking an ordinary bicycle, he removed the wheels and the forks, leaving only a triangular frame supporting the seat, the handle-bars, and the pedals and sprocket wheel. The latter he geared to rotate a two-bladed silk propeller. Behind the framework he placed a silk rudder with a bamboo frame, manipulated by means of cords running forward to the handle bars. The main frame of the airship is built of slender spruce rods. On this frame the mechanism is supported, and to it the gas bag is attached by means of the net. Young Dixon has succeeded in making successful ascents with his "sky cycle."

AN IMPROVED LATH CUTTER.

The accompanying engraving illustrates a machine adapted for cutting stock of a regular shape into

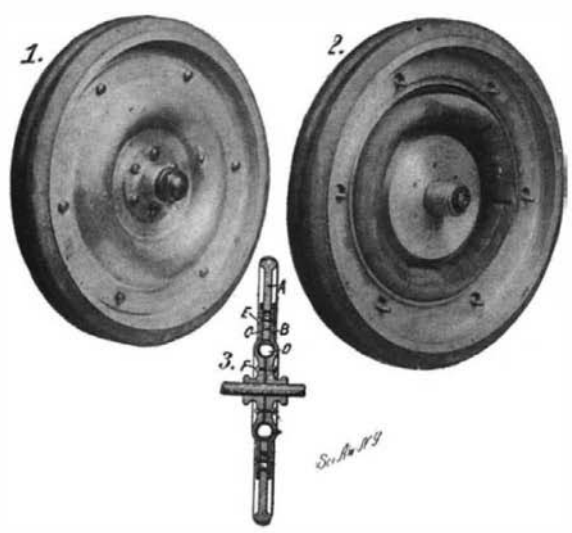


AN IMPROVED MACHINE FOR CUTTING LATHS.

laths. Briefly stated, the machine comprises a single horizontal saw adapted to cut a slab from the stock, and a series of vertical saws, which subsequently cut the slab vertically into a number of laths of the proper thickness. The stock may be of any irregular shape, provided one face is flat. The machine is formed with a carriage *A*, mounted to travel on guides over the saws. The stock *B* is supported by this carriage between a pair of jaws. One of these jaws is fixed, and the other, which is attached to a hand lever, is normally pressed against the stock by means of a spring. The horizontal saw is shown at *C*. This is set at the required height above the table of the machine, so as to cut the stock into slabs of a thickness equal to the width of the laths. Immediately back of the saw *C* is a gang of saws *D*, which operate on the slab as it issues under the horizontal saw *C*. The saws *D* are keyed to a common spindle mounted in a hinged frame, so that they may be moved up or down, according to the thickness of the slab on which they are adapted to operate. The hinged frame is connected by links to a pair of bell-crank levers *E*, which, in turn, are connected to a hand lever *F*. By moving this hand lever the saws may be raised or lowered, as desired. It will be understood that in feeding the stock to the saws, the carriage is moved by hand along the guides. A patent on this improved lath cutter has recently been granted to Mr. Herschel Oldham, of Deland, Volusia County, Fla.

IMPROVED VEHICLE WHEEL.

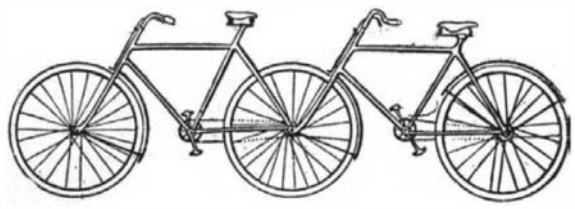
Instead of placing the pneumatic tube of an automobile wheel on the tread, where it is most subject to wear and is in constant danger of being punctured, Mr. John H. Forrest, of Marion, Ind., has devised a wheel in which the tube is located midway between the hub and the tread, thus protecting the tube from rupture and, at the same time, preserving all its cushioning qualities. The tread of the wheel is protected preferably by a hard-rubber tire, although a tire of metal, wood, or composition may be used. The form of the wheel is illustrated herewith. As may best be seen in the cross-sectional view, the wheel comprises a body section *A*, formed of a tread portion with an inwardly-extending annular flange, and a hub section composed of two disk members *B* and *C*, which are firmly fastened together by bolts or rivets *F*. The disks *B* and *C* are so formed as to provide between them an annular chamber, in which the pneumatic tube *D* is placed. From this chamber outwardly the disks are spaced apart to receive the flange of the body section *A*, which bears against the tube *D*. Opposing grooves are formed in the inner faces of the disks *B* and *C* to receive hydraulic or other packing, so as to render the connection between the body and hub sections dust and water proof. A series of openings are formed in the flange of the body section, and passing through these openings, are a set of bolts *E*, which serve to connect the disk members *B* and *C*. The openings are much larger than the bolts, and allow a limited movement between the body and hub sections of the wheel. It will be evident that in practice, the weight supported by the wheel will be carried by the pneumatic tube interposed between the flange section *A* and the hub. The tube *D* may be either a pneumatic tube, a solid rubber ring or a cushion of rubber.



IMPROVED VEHICLE WHEEL.

AN IMPROVISED TANDEM.

The following suggestion culled from a Spanish paper and sent to us by the Rev. R. White, S.J., of Ybor City, Fla., may be found useful for bicyclists who travel in company. In the case of a serious puncture, or other accident to the front wheel of one of the bicycles, if repairs cannot readily be made, a practical remedy is to detach the injured wheel and fasten the front forks of the bicycle to the hind wheel of another machine, as shown in the cut. In this manner the cyclists may complete their journey with the

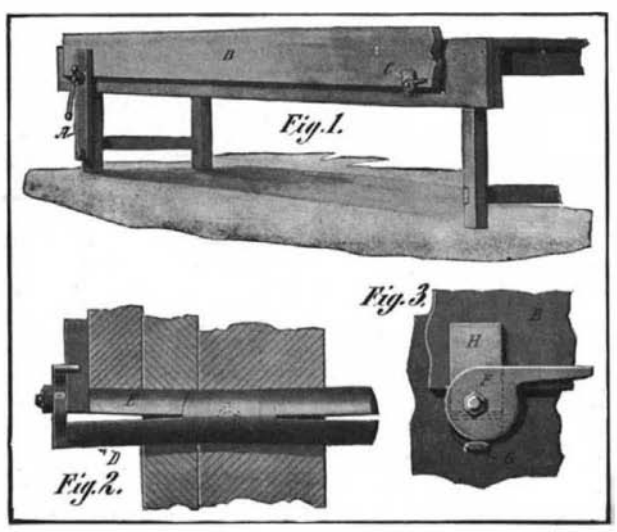


AN IMPROVISED TANDEM.

sole inconvenience of having to carry the crippled wheel, should they think it desirable to do so.

AN IMPROVED BENCH STOP.

Carpenters' benches, as ordinarily constructed, are provided with holes in the apron of the bench, in which pins may be inserted to support one end of the board while the opposite end is clamped in the vise. This method of supporting the work is not without its faults. The pins are apt to work loose and drop out and, furthermore, they do not hold the work firmly against the apron. In the accompanying illustration, we show an improved form of bench stop, which may be locked in the holes in the apron, and which is formed with a jaw adapted to clamp the work tightly against the apron. Fig. 1 shows a bench equipped with this device. At *A* is the usual vise, which supports one end of the work *B*; the opposite end being supported by the improved bench stop *C*. The construction of this bench stop is shown more clearly in Figs. 2 and 3. It will be seen to comprise two members, *D* and *E*, which are hinged together. When in closed position, these members are in the form of a pin. Mounted on the outer end of the member *E* is an eccentric *F*, which is adapted to bear against the lug *G*, formed on the member *D*. The eccentric is provided with a handle, and by depressing this handle, the two sections *D* and *E* are swung open, thereby locking the stop in the apron. The section *E* carries a jaw *H*, which bears against the work *B* and clamps it to the apron. A patent on this improved bench stop has recently been granted to Mr. Merton R. Raynesford, of Ellis, Kansas.



AN IMPROVED BENCH STOP.

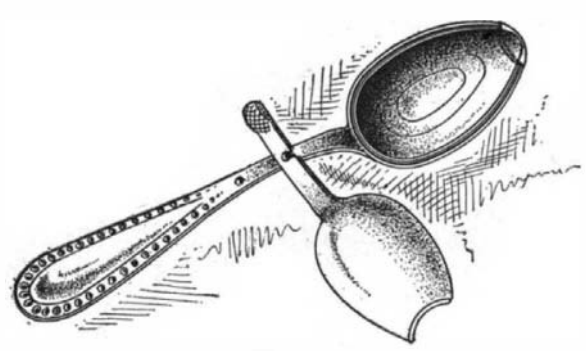
ODDITIES IN INVENTION.

Adjustable Support for Chairs.—A resident of Chicago has devised a support for chairs, whereby the chair seat may be adjusted to any desired height. The accompanying illustration represents this adjustable support as applied to a rocking chair, although it will be evident that it could be used equally as well on any other type of chair. Secured to the under side of the seat, at the rear, is a rack formed of spring metal. The rack is adapted to engage a transverse rod, which is mounted to slide toward the front or the rear of the chair seat. A pair of supports are hinged to this rod

ADJUSTABLE SUPPORT FOR CHAIRS.

at their upper ends, while their lower ends are secured in sliding adjustment with the rockers at the rear. Another pair of supports run diagonally from the forward ends of the rockers to a pair of brackets at the rear of the seat. These supports are journaled on a common pivot where they cross each other. It will be evident from this construction that by lifting the rack out of engagement with the rod, the supports attached thereto may be swung on their pivot to the rear and thus raise the chair seat, or forward to lower the chair seat. The teeth of the rack are preferably inclined rearwardly, so that when it is desired to adjust the seat to a higher level, it will not be necessary to lift the rack.

Medicine Spoon.—The accompanying illustration shows an improved spoon, which will prove of value in the nursery or the sickroom. The bowl of the spoon is provided with a cover, which is cut away at the end to permit pouring out the contents of the spoon without spilling. The cover is formed with a lip which fits into a groove in the edge of the bowl, so that it will be sealed against leakage. When it is desired to fill the spoon the cover may be readily swung to one side, and it may be entirely removed to permit of cleaning the parts. The bowl of the spoon is formed with graduation marks to indicate a teaspoonful, a dessert spoonful, etc., so that the quantity of liquid may be easily measured. The handle is so shaped that when the spoon is laid on any flat surface, the bowl will be held level to prevent spilling of the contents.



MEDICINE SPOON.

Mrs. Chadwick, wife of Admiral Chadwick of the U. S. navy, has invented a carrier for the removal of disabled soldiers from a battlefield.

One of the greatest advantages of the invention lies in the fact that the wounded soldier can be carried in an upright position, so that the loss of blood is diminished in many cases. Another important item is that when the wounded man is being carried between two comrades, the latter would have free use of their arms for handling their muskets. The whole device weighs only six pounds.