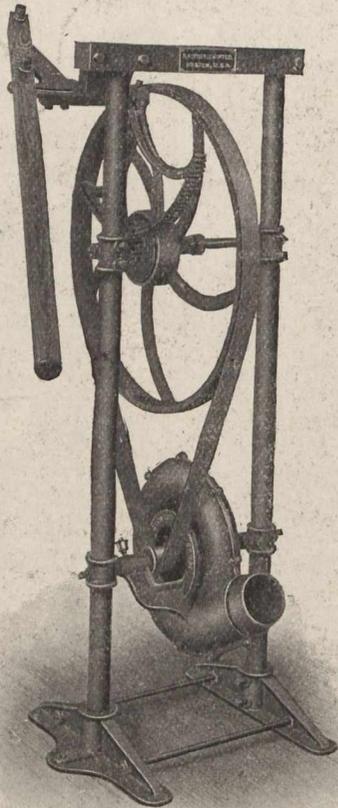


### THE STURTEVANT IMPROVED HAND BLOWER.

In these modern times men are always seeking devices by which they may accomplish the greatest results with the least exertion. To this fact, doubtless more than any other, was due the rapid introduction of the hand blower as a substitute for the old-time bellows. During the years which have elapsed since this change the B. F. Sturtevant Co., of Boston, Mass., pioneers in the manufacture of blowers, have been perfecting their design and construction until their hand blower, known as Style A, has shaped itself into a new design known as Style B, as herewith illustrated. These hand blowers have been extensively introduced in connection with new forges of all kinds, and have likewise been applied to old style brick and iron forges as simple, efficient and economical substitutes for the bellows. Not only are they adapted to forge blowing, but can readily be applied as portable ventilating apparatus. They are simple in design, strong, compact, economical in operation and portable. The lower is ad-



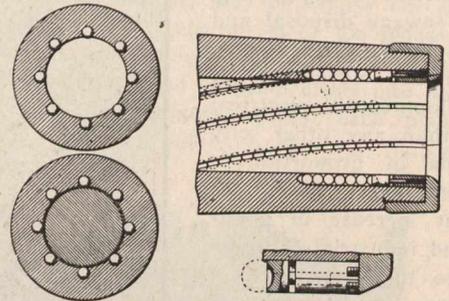
justable on the shaft, and its outlet may thus be set to discharge in any direction, and readily connected to the forge tuyere by means of galvanized iron piping. The blower is of cast-iron, strongly constructed; has a steel shaft running in babbitted boxes, and a fan wheel of galvanized steel solidly riveted to a composition hub with extending arms. The frame is well braced, and is so arranged that the slackness of the belt driving the blower may be taken up by lowering the blower shaft, which is supported by collars sliding on the frame. The blower may be screwed to the floor by holes in the feet. These hand blowers are made in two sizes. The total length on the floor of style B is 18 inches, while the total height of the frame, not including the handle, is 48 inches. The driving wheel is 24 inches in diameter, the blower outlet is 3½ inches in diameter, and the complete outfit weighs but 135 pounds. Style B-2 is of slightly larger dimensions, and has proportionately greater capacity for delivering air. The driving wheel is 24 inches in diameter, the blower outlet is 4¾ in. in diameter, and the complete outfit weighs 155 pounds.

### BALL-BEARING ORDNANCE.

A unique application of the ball-bearing principle in the reduction of friction is seen in the rifled gun, invented by Capt. O. C. Cullen, a United States officer, who commanded a battery in the Spanish-American war. The new principle is the inserting of balls in the grooves of the rifle. It is

stated that this is the first radical improvement in rifling since 1852, the ingenuity of ordnance makers being devoted towards developing breech mechanisms and other details of ordnance construction to the neglect of the barrel.

The advantages of the weapon may be summed up as follows: The ball-bearing grooves give a rotary motion to a smooth projectile, something that has been long sought for but never before attained. The smooth projectile is much cheaper, as no copper band is required, and the energy that is consumed in forcing a banded projectile through the grooves of an ordinary rifled gun is added to the force behind the projectile, thus increasing its velocity, penetration and range. It is claimed that the strain on the wall of the gun is reduced seventy-five per cent., except over the breech, where the initial explosion occurs, so that the weight of the gun may be considerably reduced, thus cheapening cost and facilitating ease of handling. The life of the gun is prolonged indefinitely. When one set of balls is worn out another can be substituted. The average life of one set of



balls is 3,000 rounds. Calculus shows that it is possible to renew the balls four times before metal fatigue limit of the walls of the grooves is reached. The velocity and penetration of the projectile is increased. In a test with the Driggs, Hotchkiss and Maxim guns, which are said to be the best types of modern rifled ordnance, it is claimed that the Cullen gun showed its great superiority. The average velocity of the latter at the muzzle was 3,200 feet per second, as against 1,800 for the Driggs and Hotchkiss and 2,000 for the Maxim. All four were fired at a plate of nickel steel 20 feet square and 1¾ inches thick at 3,000 yards range. The projectile from the Cullen gun penetrated the plate, ricocheted and was picked up 1.626 yards beyond, embedded 18 inches in the dirt. The Driggs and Hotchkiss failed to penetrate, and glanced into the earth in front. The Maxim stuck in the plate with the point projecting 5/8 of an inch through it. The test was made with a two-pounder, the conditions being precisely the same, except that the ball-bearing gun used a smooth projectile and all the others banded projectiles.

The initial power of the charge not being required to force the soft metal band of the projectile through friction grooves, the length of the barrel may be shortened from 75 to 85 calibres to 45 to 55 calibres, or even less. Friction being reduced, the gun does not heat up to such an extent. The absence of the ring of soft metal around the projectile will permit the use of nose fuses, which are more reliable than base fuses. The smallness of the recoil will permit of lighter gun carriages being used. The band on the projectile being dispensed with, the flight of the smooth projectile will not be interfered with by jagged excrescences formed on the band in its passage through the grooves, thus promoting accuracy.

The accompanying diagrams will explain the principle of the invention, which can be applied to all classes of firearms—cannon, rifles and revolvers. The smaller of the cuts shows a glycerine cushion at the muzzle, against which the balls rest.

A number of Governments have adopted the ball-bearing gun, and Capt. Cullen is now in Canada bringing it under the notice of the militia authorities. His works are at Waterlick Station, Virginia.

The new bridge over the Zambesi, at Victoria Falls, Africa, will cross the river 420 ft. above the water, being the highest bridge in the world. That distinction now rests with a bridge over Stony Creek, on the C.P.R., in the Rockies.