Spacing for Prime Numbers on the Universal Milling Machine.

BY W. G. LUPER.

Having followed the De Leeuw method of spacing on the milling machine very closely as the different articles appeared in the "American Machinist," Mr. Beale's contribution in issue No. 13 is doubly interesting. His experience seems quite identical with our own, except that we did not try the spacing of 175 to a conclusion as he did.

We were placing graduations on the cross-slide screws of our lathes and since most of them were 6-pitch (for which I will never forgive the makers when 4 or 8 is much more reasonable) they required 166⅔ spaces to read thousandths, to the extent of one turn, which was very easily accomplished by the De Leeuw method. To profit by Mr. Beale's liberal solution, or, in fact, any solution or rule, one must possess a rudimentary knowledge of proportion or machine-shop arithmetic, so sparingly used by the craft in general.

Here is a rule that suggested itself after many calculations:

Select a number the machine will index for near the desired number; divide the selected number by 40, and the quotient will be the number representing the gear to be used on the worm. The difference between the number desired and the one selected will be the number representing the gear to be used on the spindle. The remainder of the problem is like calculating the gears to be used for screw cutting: *i. e.*, multiply both by some number that will give the gears at hand.

Example: Desired number, 177; number selected (and machine indexed for), 180; 180 ÷ 40 = 4½, gear on worm; 180 — 177 = 3, gear on spindle. Multiplying both by 16 gives 72 gear on worm and 48 gear on spindle.

Another: Desired number, 191; number selected, 200; 200 ÷ 40 = 5, gear on worm; 200 — 191 = 9, gear on spindle. Multiplying both by 8 gives 40 gear on worm, 72 gear on spindle.

Again: Desired number, 166⅔; number selected, 160; 160 ÷ 40 = 4; 166⅔ — 160 = 6⅔. Multiplying both by 6 gives 24 on worm, 40 on spindle.

I enclose a table of gears for use on a Brown & Sharpe milling machine for spacing all numbers from 50 to 250 not on our Brown & Sharpe card. 46 and 80 are the only gears we had to make to complete the list. The table was compiled by Mr. F. H. Sovereign, of our toolroom force, after we had made many joint experiments. I submit it in the hope that it will prove a help to the many who will not or cannot take the time to learn the theory and trust it will be of value to the craft in general.

Mr. Sovereign forwarded a copy of the enclosed table to the Brown & Sharpe Company and received a remittance therefor. If we are under any obligations not to use it in this manner, please advise me.

Mare Island Navy Yard.

Editorial note.—We submitted this entire matter to the Brown & Sharpe Manufacturing Company, who reply as follows: "We shall be pleased to have you make use of the table and would request that the following note accompany it:" The note is as follows: "Messrs. Brown & Sharpe have set up every combination of gears in this table and have corrected it in several places. In one case the gear ratio was not right; in another case the gears could not be mounted in place. For 211 and 219 the gears 86 and 24 reach each other, and hence they are treated as compound geared with two 24-tooth gears on the stud, in order to have the two combinations consistent with the rest of the table."

The table as here given contains the Brown & Sharpe corrections. The method has now been reduced to what appear to be its lowest possible terms. With the addition of two gears only to the usual outfit the range of work possible on the universal milling machine has been extended to include all numbers up to and including 250. Comparison of this table with the regular Brown & Sharpe table will show that up to that number there are no gaps. We count both our readers and ourselves as very fortunate in this whole matter. It is seldom that we have the satisfaction of publishing a more interesting contribution to machine-shop methods.

A Craftsmen's Club.

The following, from "The Practical Engineer," London, may contain a suggestion worthy of the attention of workmen in some of our American cities:

"A club, under the above title, open to all respectable men skilled or interested in any art or craft, was founded at a meeting held here [Birmingham] on March 26, 1901, and to invite applications from anyone interested in this movement. The object of the club is to enable readers of various technical papers to meet personally, to form a library to facilitate the acquisition of information in case of minor technical difficulties in perfecting and finishing work of different sorts, to encourage the undertaking of useful hobbies, to lessen their expense, and to increase their usefulness. Lectures and demonstrations are to be encouraged, and an effort made to take premises for the sale of work done by members. Full reports of proceedings will be obtainable, representatives are to be appointed in various towns, and a staff of experts and advisers appointed as the club develops. The subscription is 2s. 6d. [60 cents] quarterly.

"It is claimed that while the general idea of such a club is not new, there is a novelty in its method of seeking a common basis for active results, and the utmost precautions are being adopted to build up the club on good economical and financial principles. No dividend is to be payable. One-third of the fund is to be devoted to reserve, and to revert to charity if the club should dissolve.

"For the time being it does not seek the support of those of very limited means or time."

Why the last sentence was written is not obvious. Better take anyone who will pay the subscription, "and no questions asked."

The Luger Automatic Pistol.

BY GRAHAME H. POWELL.

The limited range of the revolver is due in great measure to the escape of the powder gas about the cylinder. This fact, in conjunction with other well-known drawbacks to the use of revolvers as military weapons, has caused inventors to look to the principles employed in magazine arms for a solution of the problem of an improvement of this essential small arm. What is known as the automatic pistol of to-day seems almost a perfect realization of the ends sought. Though called automatic this weapon is in reality only semi-automatic, as successive pressures on the trigger are necessary to its operation.

This weapon is a repeating arm in which the force of the expansion of the gas—the recoil, or "kick"—is utilized after each shot to open the breech-block, extract the empty case, cock the firing pin and, by means of a recuperative spring charge the pistol with a new cartridge, the operator merely having to press the trigger for each successive shot.

A great number of inventors have been interested in the question of automatic pistols, and the results of their labors have frequently been described in the technical journals as well as in special pamphlets. At the present time tests are being conducted by the various foreign governments with a view to the adoption of the most efficient weapon of this class. Among the arms tested are the Mannlicher, Mauser, Roth, Bergmann and Luger, and in the United States the Colt also.

As the United States War Department has recently conducted a test of the Luger pistol among others, and as this arm has been adopted by the Swiss Government, a people who do not reach conclusions hastily, it will be more particularly described. The details of the description are from an article which was written for the "Swiss Military Review" by Major de Meuron, a member of the commission which recommended the adoption of the arm by the Swiss Government.

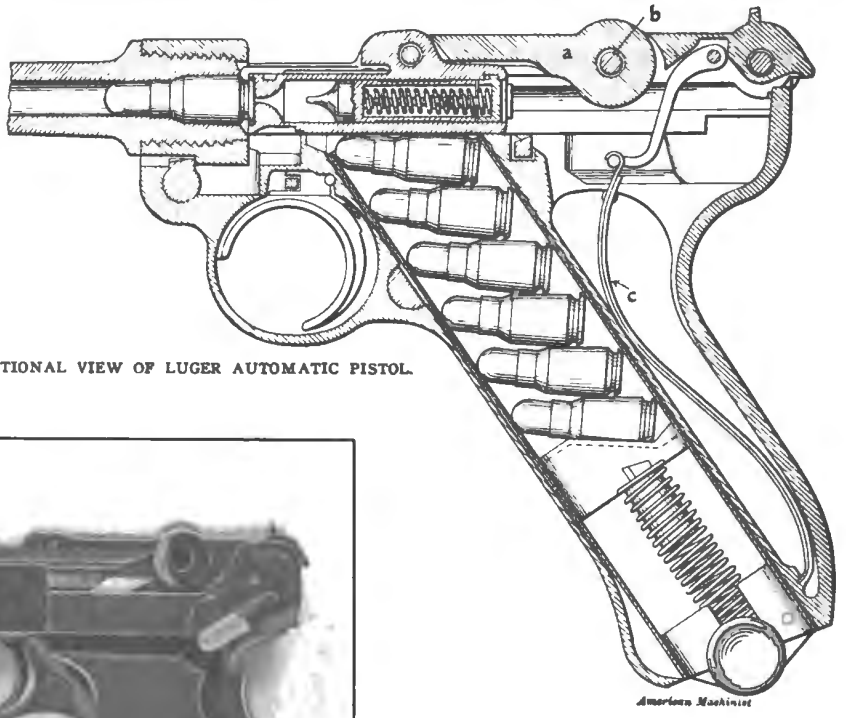
The Luger pistol is manufactured by the Deutsche Waffen und Munitions Fabriken of Berlin.

A study of the accompanying photographs will clearly indicate the operation of the arm.

At the moment of discharge, the gas acting upon the base of the cartridge case,

pushes to the rear the barrel and the breech-block, which slides along grooves in the framework. During this movement, which amounts to 5 millimeters, or about 3-16 inch, the movable breech and the barrel slide as one piece. The breech, however, continues to move by its momentum, the rollers of the knee or toggle joint bearing against the curved butt piece of the frame and causing a circular movement of the link *a* about its axis *b*, Fig. 4.

The knee rises until the moment when the main spring *c* contained in the stock is entirely compressed, as is also the percussion spring. The cartridge case carried



SECTIONAL VIEW OF LUGER AUTOMATIC PISTOL.

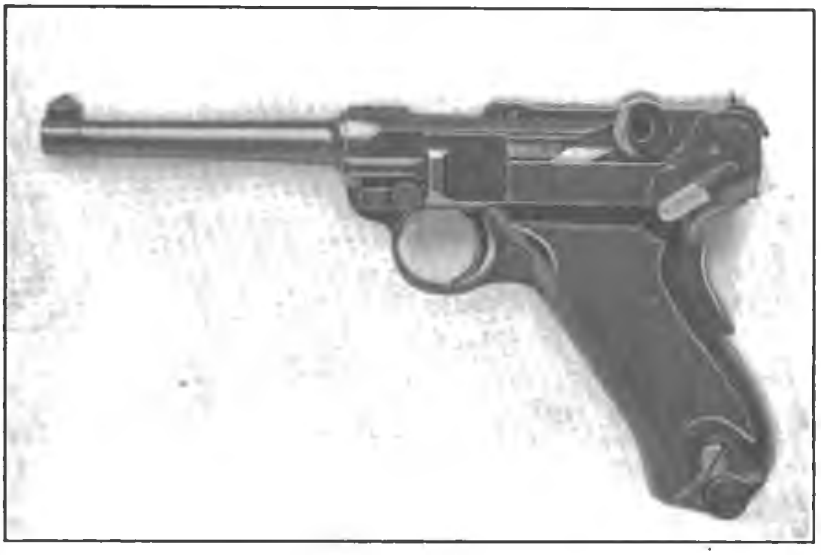


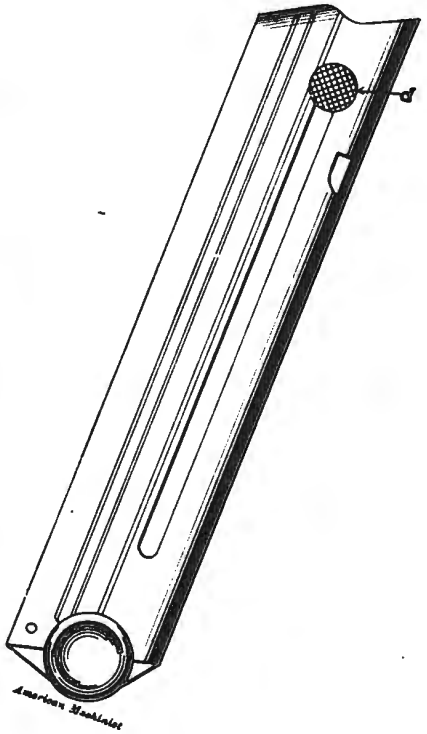
FIG. 1. THE LUGER AUTOMATIC PISTOL.

FIG. 2. THE LUGER AUTOMATIC PISTOL.

along by the extractor strikes against the ejector which throws it out. The ejector projects from the inner right-hand wall of the breech-casing.

The seat of the breech-block being clear, the upper cartridge of the magazine is pressed by a spring in the magazine in front of the head cylinder. The main spring, compressed by the recoil, pushes forward the breech-block through the medium of a stirrup which connects the two pieces. The knee lowers itself half way at the same time communicating its movement to the receiver and to the barrel, while the firing pin strikes against a lug (which projects from the inner left-hand wall of the receiver) and the percussion spring remains compressed.

As the knee straightens out, the barrel and the breech-block again act as one piece. The arm is thus again loaded, cocked and ready to fire. The firing pin being released by pressure upon the trigger springs forward and strikes the cartridge. After the last cartridge has been



MAGAZINE FOR LUGER AUTOMATIC PISTOL.

FIG. 3. THE LUGER PISTOL DISASSEMBLED.

fired, the button *d* on the magazine, Fig. 5, presses against a small spring which projects into the frame and engages in a notch in the cylinder, and the breech-block, instead of returning forward, is thus kept raised up as in Fig. 2. The line of sight being thereby entirely hidden, the operator is warned that the arm is empty and that he must reload by putting in a new magazine. This extremely ingenious arrangement does not exist in any other automatic pistol.

After the introduction of a new magazine into the stock, it is necessary only to draw the breech block slightly to the rear by means of the rollers grasped between the thumb and finger of the left hand, and allow it to snap into place, and the arm is again ready to fire.

The curved piece seen projecting from the rear of the stock near the top normally takes the position shown in Figs. 1, 2 and 3, and when it is in this position the pistol cannot be fired, because a portion of this piece interferes with the movement of the trigger. It also prevents the breech from being opened. In grasping the pistol by the stock, the hand presses on this part, and it is depressed and the breech block and trigger are again free to operate. The spring is very light, so that the pressure required to do this is scarcely appreciable.

The automatic safety device is especially designed for a military weapon. As the firer draws the pistol from its holster it is ready to fire at once. As soon as it is returned it is automatically placed at "safety."

As the weapon is also intended to be used for target practice, an additional mechanical safety device is provided. This consists of a small lever, just above and to the rear of the stock in Figs. 1 and 3. A small catch at its lower end, when the lever is pushed up, engages a slight projection on the piece last described, and the pressure of the hand can no longer act upon the mechanism of the automatic safety device, which is thus made immovable.

The following are some of the details of the Luger Pistol: Caliber, 7.65 m/m (0.301 inch); length over all, 238 m/m (9 5-16 inches); length of barrel, 120 m/m (4 11-16 inches); travel of bullet in bore, 107.2 m/m (4¼ inches); recoil of barrel until breech-block is separated, 5 m/m (3-16 inch); total recoil, 10 m/m (⅜ inch); rifling, four grooves, 3.1 m/m wide and 0.125 m/m deep; sighted for 50 meters (165 feet); length of line of sight, 214 m/m (12 5-16 inch); weight of arm without magazine, 835 gr. (29.5 ounces); weight of magazine, 57 gr. (2 ounces); velocity of projectile, 347 m. (1,140 feet per second); maximum gas pressure 3,160 atmospheres.

A File and Index for Notes and Clippings.

A new file and index for notes and clippings is being made by J. L. Dean, of Waterville, Me. It consists of a binder with stiff board covers, enclosing twenty-six manilla envelopes. Two sizes are made, one of which takes standard 6x9-inch pages without folding. The plain side of the envelope is ruled for indexing, and it is intended that this index shall include papers and documents not clipped, as well as those in the file. The method of indexing is shown in the accompanying list:

drawing list the shop foreman places an order for the various drawings given on it in which he is interested, and by instructing his men to make the group called for, the required apparatus is produced. When the workman has the drawing put into his hands he has the whole story of the pieces upon which he is working, instead of having to consult two sheets—a drawing and a specification—and is also able to see what pieces go together, thereby being able to use judgment in the degree of accuracy with which the piece is finished.

Where the work is of such a nature that the detailed specification without the drawing is all that is needed by the men they can get this information either by consulting the titles of the blueprints and ignoring the delineation, or, if this be too clumsy, the titles can be printed by themselves and the various blueprint sheets trimmed to one size, the drawing list being used as a key or index sheet, thus giving the same information as would be given by a separate specification, but making it impossible to change the original of the specification without changing the original of the drawings, because both are the same thing. The writer feels that for many of the uses to which a drawing is put it is highly desirable to give the specification of all the parts on the drawing sheet itself. If this is done, however, it is better not to give it anywhere else, for there is danger that one will be leaned upon as the master record and the other forgotten, and that when changes are made the two specifications will become contradictory.

The Borchardt-Luger Pistol.

Editor American Machinist:

Respectfully referring to a description appearing in No. 20, this year, of your valued journal, concerning the so-called Luger pistol (written by Mr. Grahame H. Powell) I permit myself, on behalf of Herr Hugo Borchardt, engineer, Kurfürstenstrasse, 91, of this city, humbly to communicate the following:

The article referred to contains some fundamental errors, which are likely to prejudice in a certain degree the well-established interests of the above-named gentleman. On the supposition that such an injury naturally has not been intentional on your part, I beg to observe that, in general, every manufacturer has not merely a very material interest but a fundamental right that his form of construction and the products made according to this construction be accompanied with such a designation that the originator of the system is clear and plain. The pistol described in your valuable journal, which is unfairly designated as the "Luger" pistol, pertains in its arrangement unquestionably to the Borchardt system, as indeed is acknowledged in a short notice appearing in another place. In the article itself the pistol is with complete injustice denoted the "Luger" pistol, not only in one but in many places, so that every unprejudiced reader who does not know the facts of the case obtains a false idea. A new Luger system is here treated of, which in fact has no existence. Much more, the pistol referred to, as already stated, is in its system and its general arrangement utterly and altogether the intellectual property of Herr Hugo Borchardt, whose interests and good right are naturally antagonized when these facts are concealed and a false impression regarding the system created, while indeed there is presented only one of the modified forms of the Borchardt system, later developed from the original form of the same Borchardt pistol.

The author of your article states that the description of the Luger pistol was taken from an exposition on this subject by Major de Meuron in the "Swiss Military Review," and that the Luger pistol has been tested together with others in different countries—for example, in the United States—and has been adopted in Switzerland. On the contrary, let it here and now be emphatically stated that the pistol spoken of in the de Meuron article in the "Swiss Military Review" is solely and explicitly the Borchardt-Luger. Moreover, this pistol is there represented as having been admitted to the tests under the description Borchardt-Luger. In the United States tests also the pistol has figured expressly as the Borchardt-Luger pistol. Doubtless, therefore, it is predjudicial and disfiguring when the author of your article, who, indeed, has made much use of the exposition by de Meuron, speaks exclusively of the Luger pistol. It is as prejudicial as unfair, in so much more as the entire description mentions no essential detail which is not found in the frame of the Borchardt system.

This is especially true, for example, of the arrangement which is designated with so much emphasis as "ingenious" and characteristic solely of the Luger pistol, that the line of sight is covered by the breech mechanism standing open by reason of the exhaustion of the magazine. This arrangement was invented by Borchardt, like all the rest, and protected by patents in his name. It is therefore not subject to invention, and much less can it be spoken of as an arrangement solely of the Luger pistol.

I submit to your courteous consideration an original copy of the de Meuron description, which will serve as proof of the foregoing assertions, and I hope that these references will be sufficient to induce the author of your article to make a suitable correction.

CARL T. BURCHARDT,
Technical and Patent Bureau.

Berlin.

Editor American Machinist:

The writer of the above letter is correct in assuming that no injustice was intended to the interests of Mr. Hugo Borchardt in the description of the automatic pistol in issue No. 20, and while unquestionably the article in the "Swiss Military Review" referred to and described the Borchardt-Luger arm, the pistol was presented to this government for test, whether intentionally or through an oversight, as the "Luger automatic pistol," and has been so known ever since.

As to what part of this arm is the invention of Herr Borchardt there has been no evidence, so far as I am aware, presented to this government.

GRAHAME H. POWELL.

Washington, D. C., July 15, 1901.

Two Shrinkages.

During a visit to a repair shop recently the writer stood by the manager of the concern watching the shrinking of a large steel coupling on to a shaft. The latter, which was hollow, had water running through it from a hose at one end to keep it cool. When the hot coupling was finally in place the hose was withdrawn, and the water was played on the coupling, which was thereby neatly and firmly secured in place. While this work was being performed it was noticed that the machinery in the shop had slowed down, and on inquiry for the cause the manager was informed that the engine shaft had heated up and that the engineer was cooling it off. Our party adjourned to the engine room, where the engineer was seen turning the engine over slowly while he directed a stream of water through the shaft which was hollow. The manager immediately went up to the main bearing of the engine and put his hand on it; its temperature evidently satisfied him that some more radical measures would have to be adopted than those which his engineer was pursuing, so taking the hose from the engineer he turned the water on the bearing itself, and at once shrunk it on to the shaft just as he had shrunk the coupling on to its shaft in the shop a few moments before. The surprise which was depicted on his face when the engine stopped was followed by an expression of anger, and then this narrow and humorless soul expressed his sentiments in language both fluent and ornamental and promptly discharged the engineer. The writer learned afterward that the engine foundation had given way some time previous and that the engineer had repeatedly called the manager's attention to the urgency of necessary repairs. Now what was the mental action that led this man to try to expand metal by the same means that a few moments before he had used to contract it? Perhaps he was trying to emulate the man in the fable who could blow hot and cold with the same breath. It was safe to say, however, that his breath which was hot with expletives was a chilling blast to the engineer.—H. F. J. Porter, before the American Water Works Association.