FACTS about FAC

Nr 1

Oct. 1958

Published by
Transitoria Trading Company AB,
Kungsgatan 29, Stockholm C, Sweden

PRESENTATION

The purpose of this publication is to provide a forum for promoting contacts between FAC users all over the world. A similar form of contact, though on a limited scale, has existed over a number of years between FAC customers in Sweden and ourselves, and it is our sincere hope that the origination of "FACTS ABOUT FAC" will further this interchange of ideas and suggestions which we have found extremely valuable and inspiring, not to say imperative for a logical and systematic development of FAC.

For – let it be known at once – we feel that, failing such contacts, our chances of improving and perfecting FAC will be restricted. This is, of course, quite natural, when you begin to think about it. FAC is not just a dead thing, which once created, can then be left to fend for itself, but a living system for building machine models of every kind imaginable, including machines as yet not even thought of. It is a means of expressing ideas and thoughts, of visualising technical problems in a manner useful to the specialist and comprehensible also to the layman. But we can never hope to cover this immense range of problems alone, unaided by (helpful) suggestions from specialists in all fields of technology who already use FAC, or may be potential users of FAC – meaning You!

By establishing such contacts, with this publication as a medium, we want to bring experience and interesting designs, resulting from a world-wide experimental activity to the notice of all FAC users. We would, therefore, appreciate receiving reports of your experiences and results, for compiling them into a common pool of knowledge available to all FAC users, and for the improvement of FAC on the basis of your experience which will then benefit not only a few, but eventually all FAC users.

FAC is, in the first place, a kind of three-dimensional draughting material that has arisen out of the draughting-board, as it were, and taken on a shape: through the use of FAC, a new idea may be rapidly given a visual counterpart, may be tested and modified until the final solution is reached. The experimental model is often an indispensable link in solving a mechanical problem; it gives, at a glance, the answer to many questions that remain obscure as long as the project exists only in the form of the first drawings or preliminary sketches. It is also a convenient means of communicating the usefulness of a new idea to people who are not skilled in the reading of blueprints.

The demand for experimental models presents itself at a very early stage – the designer often feels the need for some practical experiences before embarking on a costly and time-consuming construction work. Tinkering with experimental models has been facilitated through the existence of FAC; there is no longer need for ordering expensive special parts, which require a long time to make and possibly becoming obsolete and worthless as the result of a design.

The practically unlimited flexibility which is a prime characteristic of the FAC system, permits many variations in trying out a mechanical problem in a very short space of time – almost as rapidly as you think it out and definitely much faster than you would prepare a drawing.

It has always been very exciting and interesting to receive information about the various uses to which FAC has been put. We could almost say that there are no two people using FAC who work exactly alike. The possibility of variation offered by the system allows every designer to impart a personal touch to his design.

We hope that the initiative we have taken by publishing "FACTS ABOUT FAC" will form the beginning of a fruitful collaboration between FAC users and us, permitting us to keep pace with the requirements of an ever-widening field of application.

TRANSITORIA TRADING COMPANY AB

FAC NEWS

During 1957, the FAC system underwent a complete revision on the basis of experience accumulated over a number of years among Swedish users. On the eve of introducing FAC on the international market, numerous improvements were introduced and new parts added. This gave us an opportunity to define the special character of FAC. A compromise between high precision and low cost was reached so that the kit will be within the reach of everybody, e.g. inventors, consultant engineers, and people who carry out designing and experimental work, and as their hobby.

THE FAC MANUAL

The FAC system is described in detail in the FAC Manual, and it also describes various design principles which experience has proved to be time-saving and ensures maximum strength and rigidity. The typical constructions illustrated in the Manual have been chosen mainly because of their instructional value. No description of this kind can, however, be complete within the limited space of a book that must not be too bulky. But it is sufficiently comprehensive, nevertheless, for a reader to acquire considerable skill in the FAC mechanical language.

FAC KITS

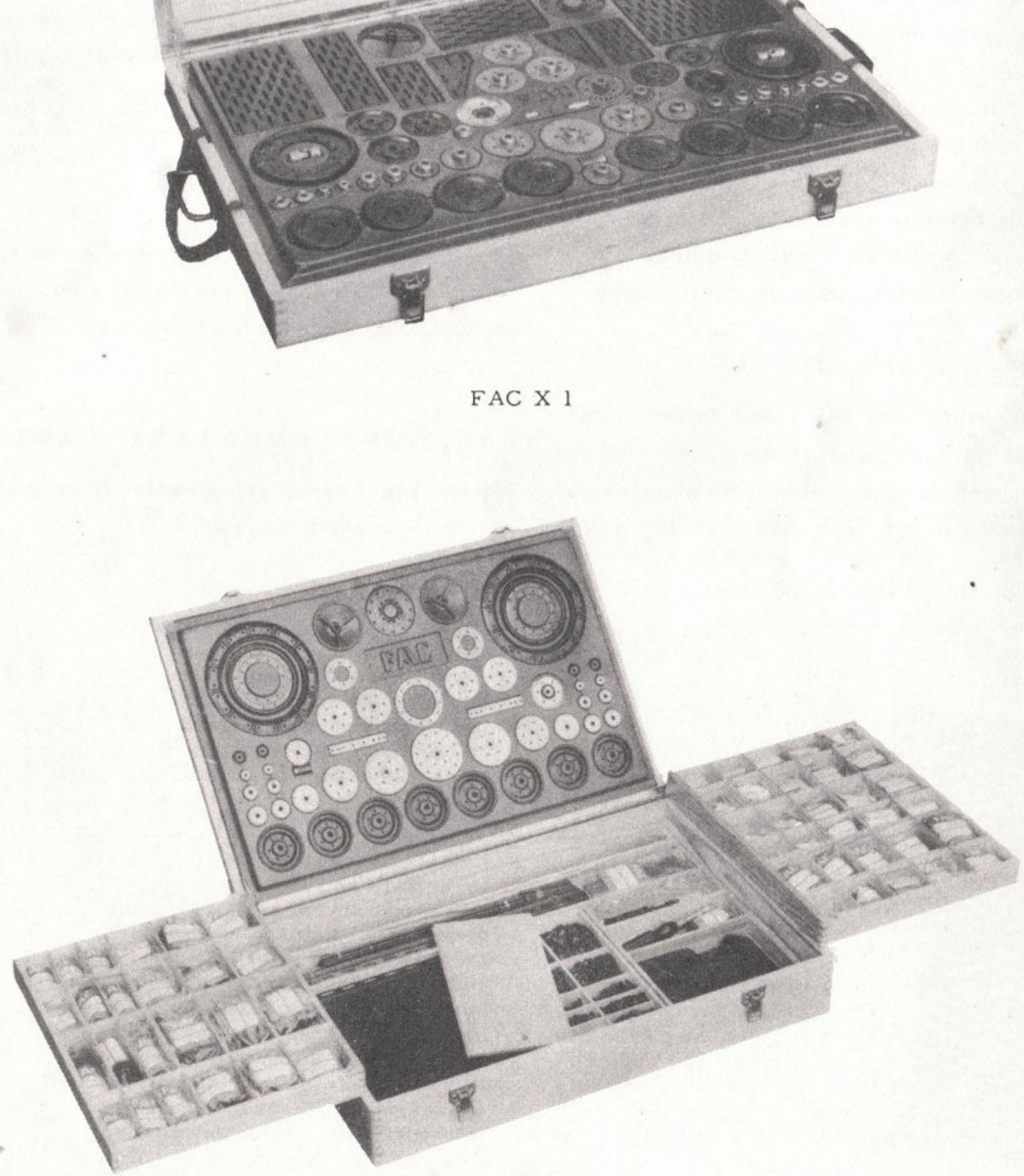
The FAC Kits, X-1 and X-2, are contained in strong wooden cases and a copy of the FAC Manual goes with every kit.

FAC SUPPLEMENTARY PARTS

These are readily obtainable from our agents throughout the world.


FAC XI
THE UNIVERSAL CONSTRUCTION KIT
MARK SYLWAN AB • STOCKHOLM • SWEDEN

FAC X 1


FAC

FAC X 2

FAC FACETS

Under the above heading, which will be a regular feature in "FACTS ABOUT FAC", we shall analyse mechanical problems of general interest to readers and describe machines involving mechanical problems with suggested solutions which may find application in other machines.

GUILLOCHE MACHINE

In this, our first number, we shall describe a machine that is highly specialised in its use, but which is of great instructional interest. The machine is a so-called guilloche machine, for tracing guilloches, i.e. the complicated rosetted and similar patterns which we recognise from bank-notes and other bond-print. The importance of guilloches derives from the safeguard they provide against forgery because of the difficulty in copying them.

In the present instance, the importance of this machine lies in the fact that it constitutes excellent proof of the high precision that can be achieved with a FAC-built machine, and the regularity of the fine texture in the guilloche reproduced as Fig. 4, shows the high accuracy obtained with this machine.

At the same time, the guilloche machine includes a great number of interesting and unusual mechanical movements.

GENERAL DESCRIPTION

The guilloche machine consists of the following sub-assemblies:-

1. The chassis and supporting structure.
2. A platform with rails and guiding racks.
3. The trolley complete with stylus drive mechanism and stylus which traces the desired guilloche patterns.
4. The rotating tracing table.
5. The Prime Mover – an electric motor with belt and pulley transmission.
6. The table transmission which produces the rotary motion of the tracing table.
7. The main drive unit comprising the trolley drive reduction gears and crank mechanisms, and the primary reduction gear for the stylus drive.

Beginning at the back of the machine – to the left in the photo – we find the two trolley drive reduction gearsets whose reduction ratios may be varied through the replacement of individual change gears. The output shafts of these gearsets drive two crank mechanisms whose stroke lengths may be varied independently. Fig. 2.

The crankpins are coupled to a pair of gear racks by means of pivoting joints sliding along columns mounted on the racks which

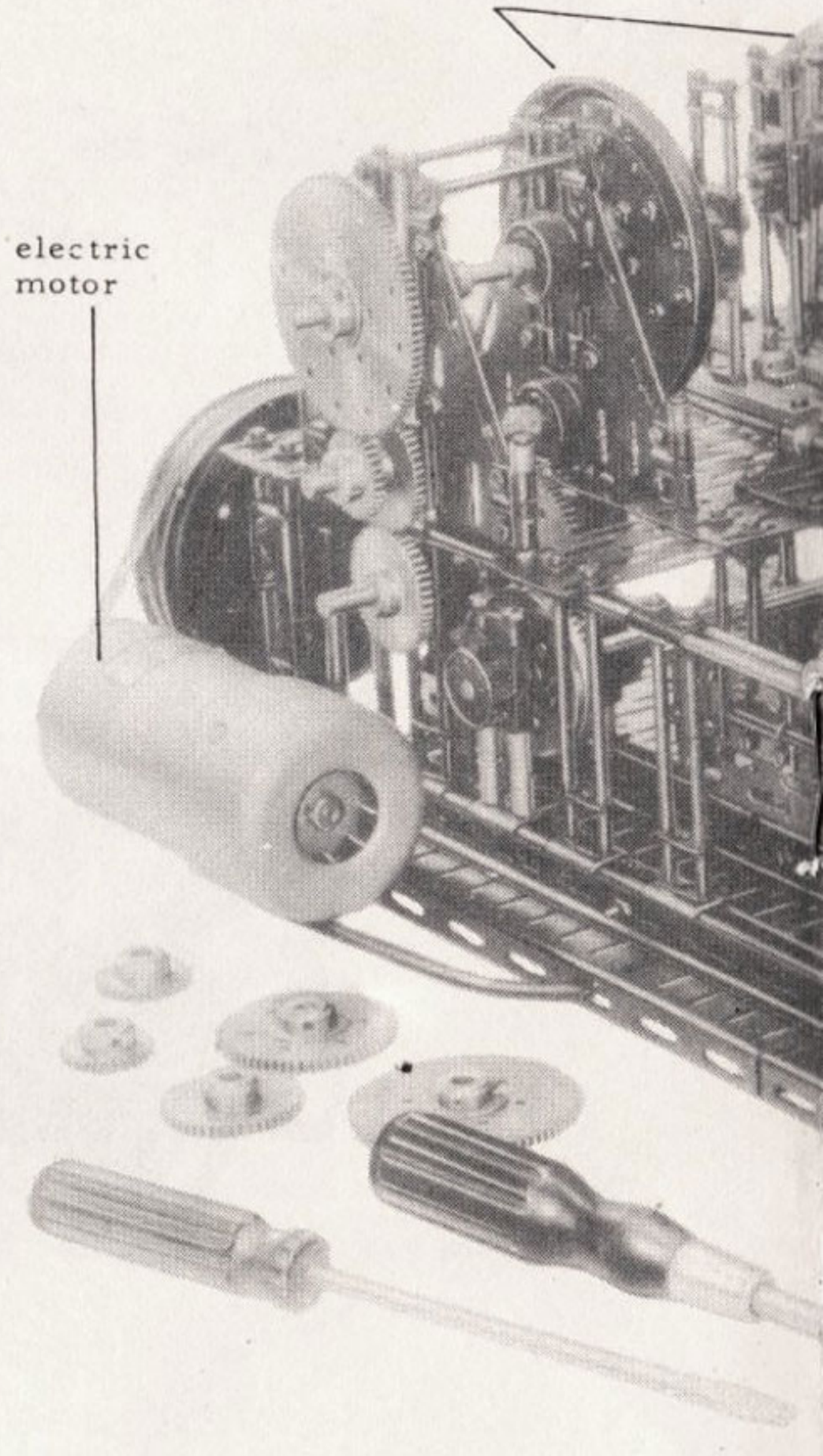
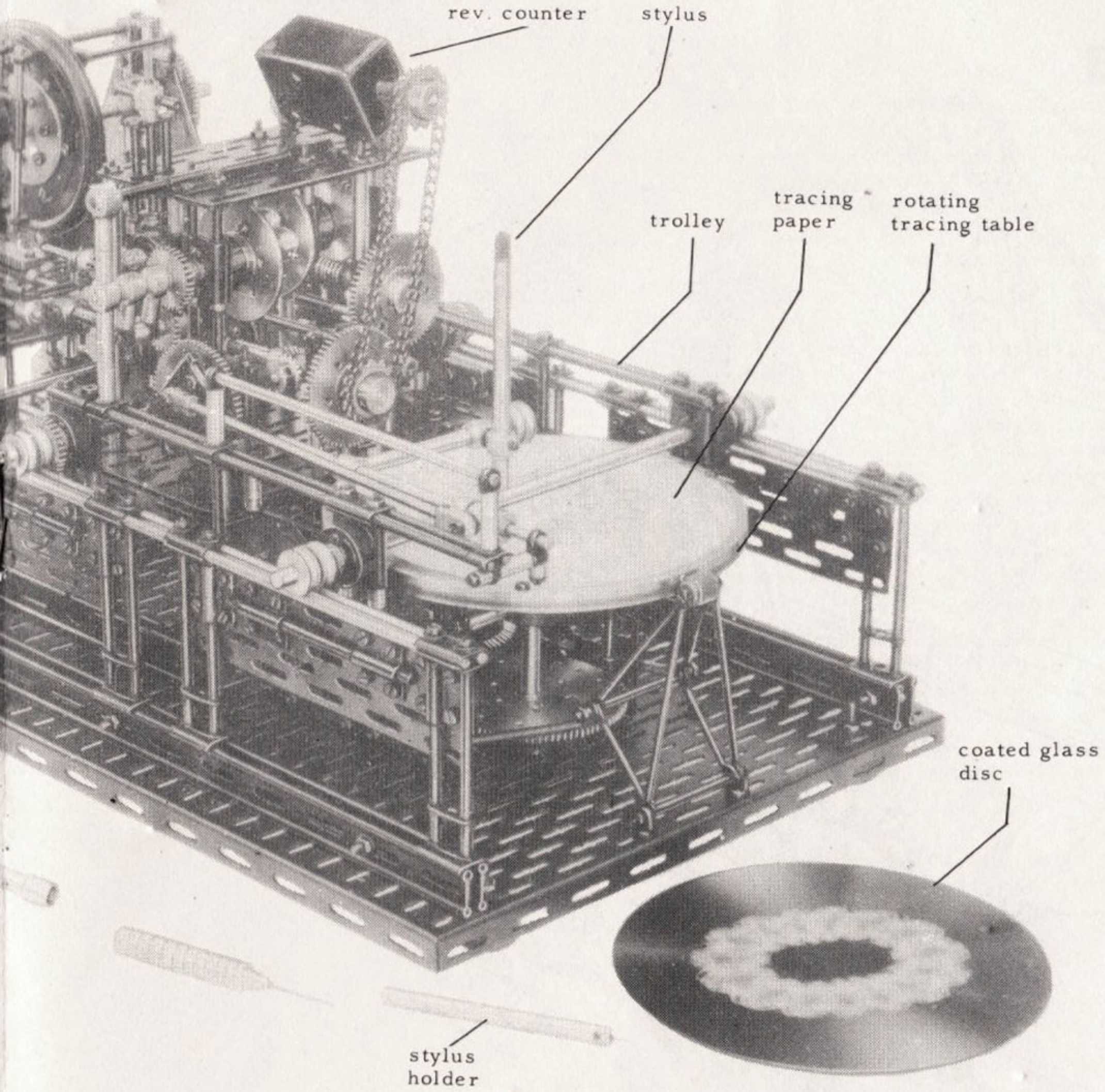


Figure 1 – Guilloche Machine made

then obtain a truly sinuosidal movement; coupling the crankpins to the racks by means of connecting rods would produce a distorted sinuosid, thus introducing an error which might, however, be of value in some cases.

The gear racks both engage with a spur gear placed between them. This arrangement constitutes, in fact, a kind of differential, and the spur gear will move at a speed which is always the arithmetic mean, i.e. half the sum of the speeds of the two crank pin projections. The spur gear movement is transferred to the trolley by a coupling rod sliding in pivoted bearings. The length of stroke, rotation speed, and phase angle of both crank mechanisms can be varied at will within certain limits. This composite crank system determines the outer shape of the guilloche pattern, i.e. the undulations of the outer and inner peripheries.

The inner pattern detail of the guilloches, on the other hand, is determined by the



with FAC standard parts. Only non-standard part is rotating tracing table.

stylus system which consists of a reduction gearset located in the main drive unit, and a further reduction gear on the trolley proper which drives a crank coupled to the stylus holder, Fig. 3. It should be clearly understood that the stylus crank drive is completely independent of the trolley drive system, and can be set irrespective of the trolley movement.

The primary reduction stage is composed of a differential of the conventional type with bevel gears, and a spur gear reduction gearset coupled to the differential in such a manner that practically any desired reduction ratio can be achieved, thus permitting the table to perform up to several hundred rotations before the stylus returns to the same point. Very complicated patterns with closely spaced lines can then be traced with very slow movements of the stylus.

This mechanism connects via a splined shaft to a spur gear on the trolley which can be brought into engagement with either of two secondary reduction gearsets, one very slow to give a trace which recedes very slowly toward the centre of the tracing table – often presenting a nearly concentric aspect to the naked eye – and one relatively fast to produce steep falls in the trace. Both systems can be set independently to a range of speeds.

The trolley section of the stylus drive has a very interesting feature in the form of an accelerating and decelerating mechanism which imparts a non-uniform movement to the crank in order to avoid the clutter of traces which would otherwise appear as dark bands near the outside and inside edges of the guilloche, corresponding to the reversing points of the crank. Such very close patterns are difficult to reproduce by photographic means.

This mechanism consists of two cranks with offset centres, connected by means of a short link. When the driving crank

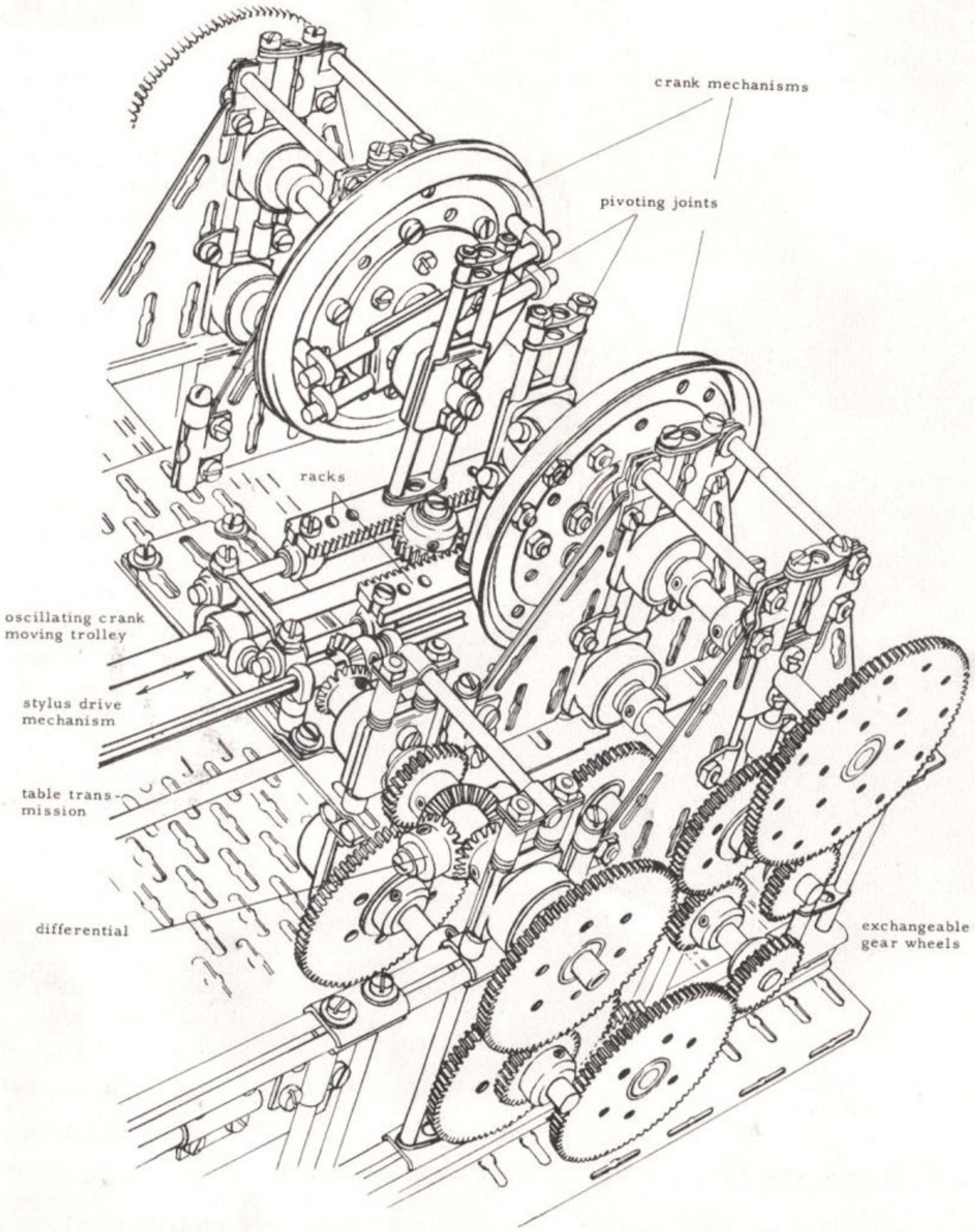


Figure 2 — Crank mechanisms of machine shown on figure 1.

rotates at constant speed, the driven crank will lag behind during one-half of each turn, and lead the rotation during the other half. This movement is coupled via a 1:2 gearset to the stylus crank which obtains a suitable non-uniform movement, and the trace density of the guilloche will be more uniform over the entire pattern.

Via a bevel gear, the motor also drives the tracing table at the front end of the machine. The rotating table carries a circular glass disc which has been degreased with hydrochloric acid afterwards sprayed with a thin coat of drawing ink dissolved in spirits. The guilloche pattern is traced on the glass disc by a gramophone needle clamped in the stylus holder. A completed tracing can be treated exactly like a developed photographic plate for making contact prints or enlargements.

The guilloche machine is representative of the highly advanced types of machines that can be built with FAC. In the present machine, only one part was specially made, namely, the tracing table which was turned from a piece of aluminium; all other parts are standard FAC parts.

The guilloche of Fig. 4 demonstrates clearly the perfect accuracy and precision that can be achieved in a FAC design, despite the fact that the drive mechanism may be highly complicated. In the instance under review, even the slightest inaccuracy in the drive, would have been shown as deformations and irregularities of the pattern traced.

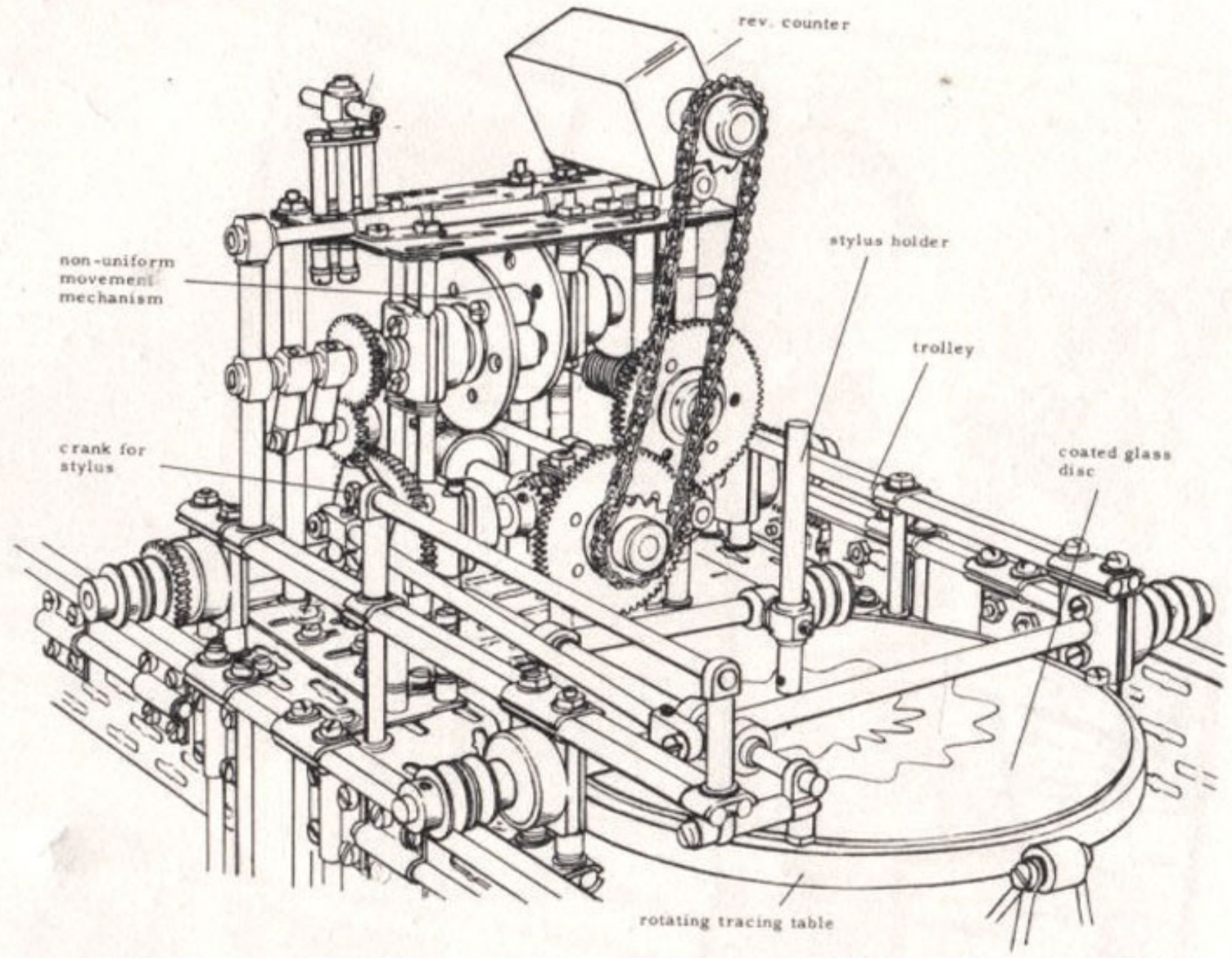


Figure 3 – Trolley of machine shown on figure 1.

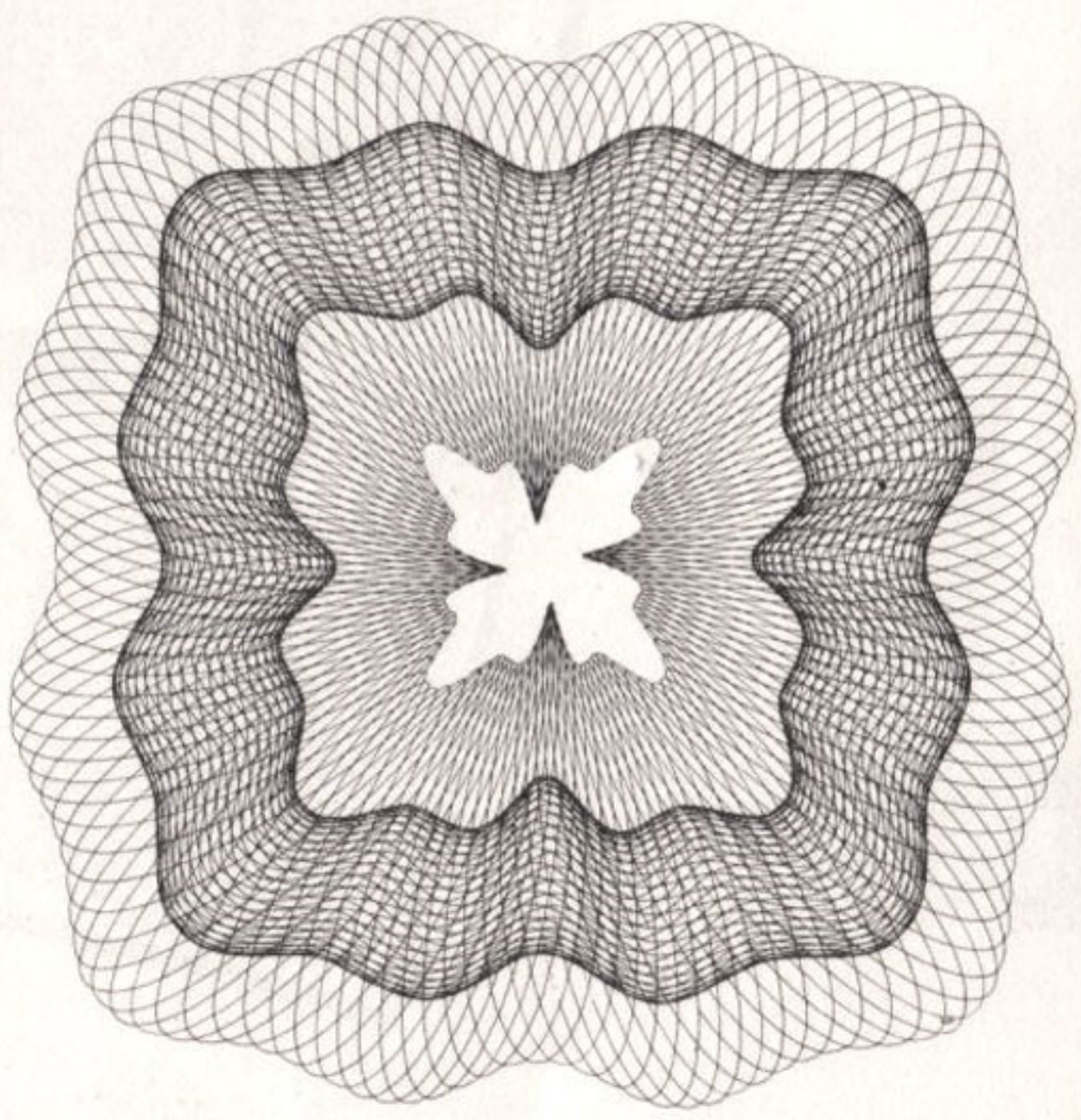
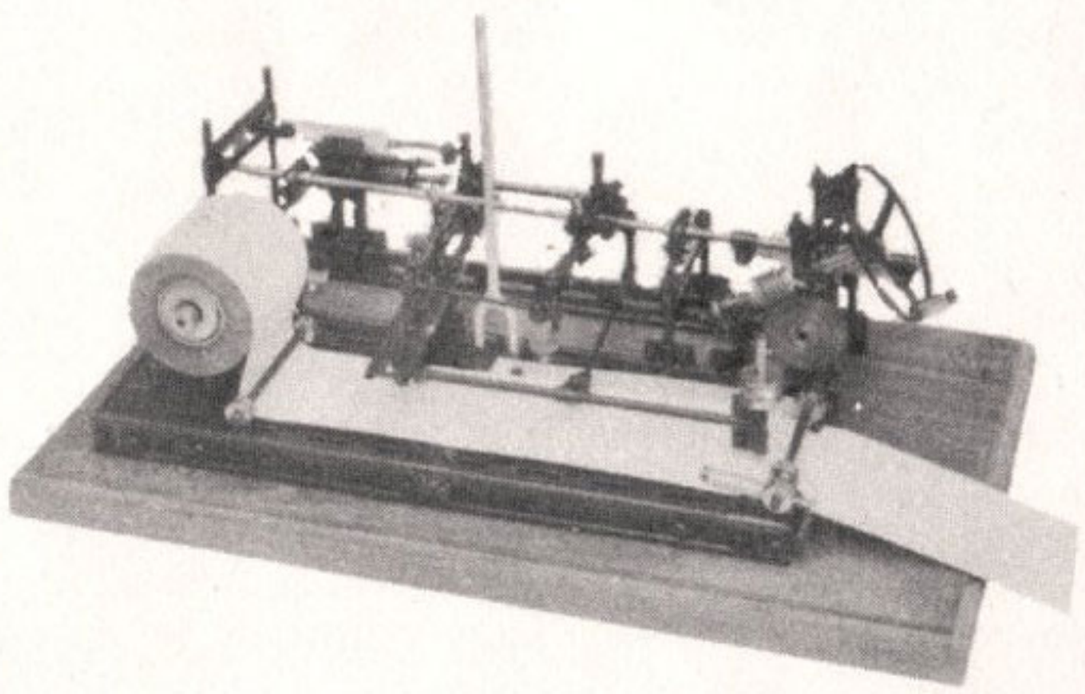


Figure 4 – Guilloche pattern made with machine shown on figure 1. It demonstrates clearly the perfect accuracy and precision that can be achieved in a FAC design.

FAC FORUM

In "FAC Forum" we will print letters from people with practical experience of FAC, together with editorial comment. We earnestly request our customers to place at our disposal photographs depicting machine models, etc. built with FAC, or mainly with FAC parts. We are prepared to pay all costs for such material and would like your permission to use it for FAC publicity, at our discretion. If the function of the apparatus is not evident from the photograph alone, we ask you to append a short explanation.

In this edition, in order to show what we mean, we reproduce here a picture of a machine built by the N.V. Philips Bedrijven, Holland, for recording the tensile strength of very thin metal wires.



Philadelphia, Pa.
The Evening Bulletin Thursday, May 1, 1958 B 45

An Inside Look at How an Auto Works

Miss Carolyn Carr, of Detr... putting gasoline into the ... neers' show at Convention...

PRODUCTION EQUIPMENT
April, 1958

FAC Division, 9551 Grand River Ave., Detroit 4, Mich. $1500.
Model Working Kits: In this line of model construction kits will be two new kits designed to enable engineers, designers, automation specialists, scientists and inventors to make precision working models of any type machine, drive or mechanism. Typical models of machines, test apparatus and mechanical motions will be shown.
Circle Reader Service Card No. 271

AMERICAN MACHINIST
April 21, 1958

Machine Construction Kits Serve as Engineering Tools

The Swedish-made machine construction kits are designed to serve as engineering tools to enable engineers, designers, automation specialists and inventors to make precision working models of practically any type of machine, drive or mechanism. Both the FAC-X1 and the larger FAC-X2 (illustrated) will be shown.
FAC Division, ... Detroit 4, Mich.

Machine construction kits allow for construction of precision working models of practically any type of machine, drive or mechanism. Made by Fac, the kits enable engineers to examine their ideas in three dimensions ... inate design defects ...

For machine construction ... rate almost any type of ... or mechanism.
THE TOOL ENGINEER
April, 1958

MACHINE CONSTRUCTION KIT

Source: FAC ... 9551 Grand R... Detroit 4, Mich.
Application: ... engineers and ... make precision ... models of ma... and mechanism ... made in Swe... tion element... bearings, ge... ets, sprock... sheaves, ... wheels, di... joints. ... beams ... construct...

For making working models
Models can be produced involving sli... transmissions, differentials and spring...
For full data refer to EMR 3776 on re...

MINIATURE MACHINES ALLOW ECONOMICAL TRIALS

Engineers, machine designers, scientists, inventors and automation specialists are making precision working models of practically any type of machine, drive or mechanism with a special machine construction kit that uses a basic construction concept of round rods and beams that are assembled into frameworks by a clamping technique. A wide variety of precision-machined mechanical components such as ball bearings; spur, bevel, internal and worm gears; gear racks; ratchets; sprockets; pulleys; sheaves; couplings; springs; wheels; disks and universal joints are utilized in the system developed by FAC Div.

Thus, it is possible to construct smooth-operating, precision-detailed mechanisms with standard kit components.

Not only does it permit development of new ideas and creation of machines and mechanisms in design work, but models made with the kit can be used to prove mechanical concepts.

Resultant models possess such qualities of large production equipment that they can be used as machines and test equipment for research and development work.

The FAC construction system was created by a Swedish inventor, Mark Sylwan, who saw in the method a means of constructing and proving machines and mechanisms which would avoid large development program expenditures on machines whose principles had not been thoroughly substantiated.

The Tool Engineer
April, 1958

PAPER INDUSTRY

Kit for making precision working models of machines

A unique new machine construction kit now being manufactured for engineers, machine designers and automation specialists enables them to make precision working models of practically any type of machine.

The construction system known as FAC uses a basic construction concept. The models are said to have such ruggedness, precision and long wear life properties that they can be used as machines and test equipment for doing research and development work. There are two sizes made in these kits . . . FAC-X1 kit and FAC-X2.

Extra parts for expanding the basic kits can be catalog ordered for delivery from warehouses in the United States. *FAC Division.*

CIVIL ENGINEERING
March - 1958

Machine Construction Kit

A unique machine construction kit designed to enable engineers, designers, scientists, inventors and automation specialists to make precision working models of practically any type of machine, drive or mechanism is now available. It uses a basic construction concept of round rods and beams that are assembled into frameworks by rugged clamping means and a wide variety of precision-machined mechanical components such as ball bearings, spur, bevel and internal and worm gears. It is possible to construct smooth-operating, precision-detailed mechanisms such as reciprocating motions, slide motions, geared transmissions, differentials and coil-spring devices with standard kit components. In addition to permitting the development of new ideas and creation of machines and mechanisms in design work, models made with the kit can be used to prove and sell mechanical concepts and serve as sales tools. FAC Division, CE-3, 9551 Grand River Avenue, Detroit ...

Page 40
PRODUCT DESIGN AND ...

Research and Development Equipment

PRECISION MODEL KIT
For making working models of m...

Precis... models ... any type ... drive ... can be ... element... this co... Using ... structi... round ... that ... into ... rugge... mean... chanical elements, the kit can be ... models for fast engineering eva... ample, using parts from the kit, ... mobile chassis model with inde... wheels, differential and steering ... constructed.

Besides the framework and be... tains rachet drive components, ... ball bearings, pillow blocks, u... rods, belt and chain drives, rac... and other mechanical componen... ibility is obtained through the ... modulus system for all par... framework, and other element... ardized to conform with this ...
••• FAC construction kit ...

Ein Anziehungspunkt der Besucher der ... schen Industrie-Messe Hannover ... den In-, sondern auch Auslan... „FAC"-Universal-Kon... satz im Dienste der ... dar. Es handelte sich um ein ... stem ausgewählter Standardteile, ... einfachen Aufbau zu verschiedenen ... schen Konstruktionen zusammen... Er ermöglicht dem Konstrukteur ... mit Versuchsmodellen nach den ... sein Verfahren schon beim beginnenden ... gang einer Idee, d. h. er kann dir... mechanischen Gebilde denken, da... und gegebenenfalls ständern kann ... sparnis an Mehrkosten und Warte... Sonderanfertigung von Teilen, die ... später umgestaltet oder verworfen w... ten ist ein weiterer Vorteil dieser ... Konstruktionssatzes. Zu bemerken ... daß das Modell nach Gebrauch auch ... lernten Arbeitskräften auseinander... werden kann. Von unschätzbarem We... ist Konstruktionssatz für Geräte, ... Hilfsmittel in Laboratorien, Versuchs... stehen doch die gewünschten Vorrichtungen ... zur Verfügung, und zwar zu einem ... des Preises, den man für eine Sonder... gung aufzuwenden hätte. Der Univers... struktionssatz weist eine restlose „Rasi... rung" auf, d. h. es ist möglich, seine ... lichen Teile an jeder beliebigen Stelle ... mit Genauigkeit eines Millimeters anzub... Die beweglichen Teile, wie Zahnräder, ... und Lager, sind von derartiger Güte, d... Betriebssicherheit von Vorrichtungen ... leistet wird, die lange ohne Überw... arbeiten sollen. Die fertigen Konstru... sehen wirklichkeitsgetreu aus und wirken ... handwerkmäßig. Der Kerngedanke des ... Systems ist die Anwendung von Klemm... lungen in Zusammenwirkung mit runden ... ben und Trägern, wobei letztere als ... wicklung der Stäbe bezeichnet werden ...
(Carl Peyrong, Bremen)

November 9, 1956 ENGINEERING

590

MODELS FOR INSTRUCTION OR EXPERIMENT

UNLIMITED SCOPE WITH FEW CONSTRUCTIONAL PARTS

Models of machinery and other engineering equipment have many uses. They may be made for instructional purposes, for experimental work, as a record of something which has been or is about to be destroyed, or by the skilled amateur simply for the pleasure of achievement. ...

SIMPLE FUNDAMENTAL ITEMS

The basis of the FAC system is a round steel rod, 4 mm. ... in diameter, which is supplied in various lengths in the FAC kits. ...

Model reciprocating frame saw, showing a typical application of the FAC system.

Un equipo de construcción para el proyectista

SERA de gran atracción para los proyectistas mecánicos un nuevo equipo de construcción de precisión que se ha puesto en el mercado después de un estudio muy completo de las vastas posibilidades de construir modelos y prototipos de estructuras con piezas normalizadas que son ellas mismas productos mecánicos esencialmente de dimensiones exactas y hechos para servicio duradero.

El sistema se limita a construcciones puramente mecánicas, ...

se preparan se eliminan, una ventaja considerable en aquellos casos en que las pruebas preliminares indican que son necesarios cambios en el modelo original haciendo que la piezas sean reforzadas o descartadas por completo. También, los aparatos especializados para uso en investigaciones y desarrollos en el laboratorio se pueden diseñar y construir económicamente sin pérdida de tiempo.

Un modelo de funcionamiento tiene el fin sumamente útil de hacer innecesarias las explicaciones detalladas y prolijas, puesto que da una interpretación visual directa de los principios involucrados. Es una base excelente para discusiones entre las personas de un grupo que trabaja en un nuevo proyecto. Y ...

Mc Graw-Hill International "Management Digest", January ...

● PRODUCT DIGEST

Model Kit Aids Engineers

Often it is easier to make a mechanical gadget than to design it on paper. With this in mind, a Swedish designer has put together some 5,000 pieces of components of good quality and precision, and packaged them in a construction kit called FAC. The set enables an engineer to make just about any purely mechanical device; parts include steel structural members, ratchet drive components, worm gears, ball bearings, pillow blocks, universal joints, tie rods, chain and belt drives.

Several companies are using FAC kits to build working models for sales demonstrators. A testing lab has found the kits handy for building mechanical testing devices. The kits are sold in two sizes. The Minor Industrial kit, containing about 2,500 parts, costs the equivalent of £45, FOB. Stockholm. The Major Industrial kit, with some 5,000 parts, sells for about £85. **Transiteria Trading Co. AB, Kungsgatan 29, Stockholm C, Sweden.**

MACHINE TOOLS

Kit Makes Designing Job Easier

You Can Work Out Your Own Machine Models

A Scandinavian inventor had fellow inventors in mind when he devised his kit.

Parts may be assembled and disassembled until results are obtained.—By E. J. Egan, Jr.

▪ Sketching an idea for a new machine or mechanism is easy. But converting the sketch into a full-size product can be a long and costly business. And when you're finished, there's always a chance the thing won't work as well as you expected it to.

A Swedish inventor named Mark Sylwan thought he saw a way for inventors and machine designers to save time and money in checking out their brain children. In 1952, he brought out a universal machine-construction kit (sort of a super Erector set).

U. S. Introduction—But the kit was much more than a toy. It was loaded with precision-made parts: rods, beams, ball bearings, gears of all kinds, racks, ratchets, sprockets, pulleys, springs, universal joints and other components. Sylwan said it could be used to make precision working models of practically any type of machine, drive or mechanism.

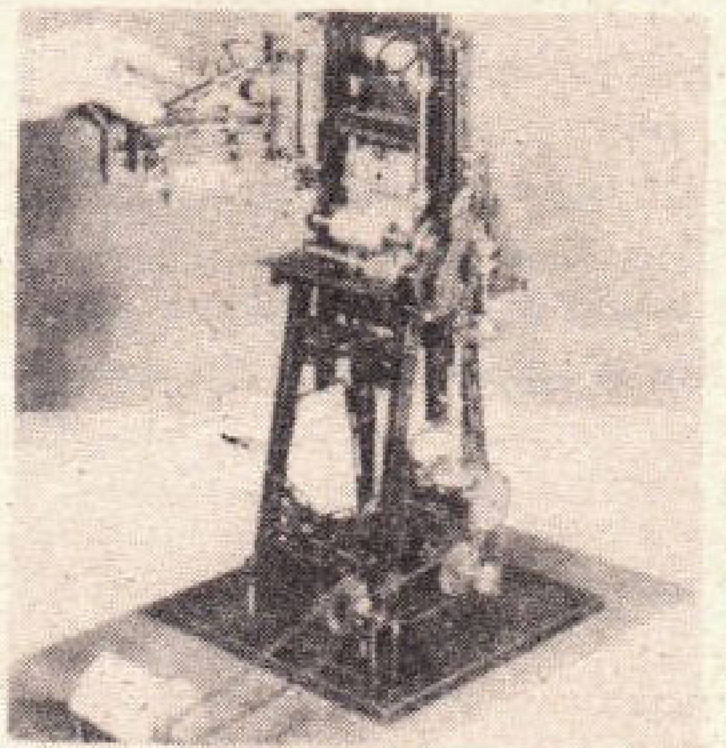
Apparently the kits were received enthusiastically on the continent. And now, improved versions of the original FAC Universal Machine-Construction System kits are available in this country from FAC Div., Overseas Commodex Corp., Detroit.

Starting the Model— Sylwan's system uses beams and rods as basic construction units. These pieces can be assembled into ragged structural frameworks. Mechanisms made up of the various kit components can then be mounted on or within the required frameworks.

Proves Out Designs—For example, FAC kits have been used to build models of such things as: huge log saws, traveling cranes, articulated railway cars, and rotary printing presses. In each case the models were set up to prove designs before final blueprints were drawn and full-scale construction started.

Nor are the kits limited to model-making. One firm used the parts to build a ball-point pen tester which gets hard use every day. Or, it's possible to build many small machines and devices for research work, for teaching student engineers, to use as sales tools.

Large and Small—There are two kit sizes, each with its own manual of basic instructions. The smaller unit has 2700 individual pieces; there are 4700 parts in the larger one, which is slanted especially toward industrial machine design and development needs.



TIME AND MONEY SAVER: Working model of a gang log saw was built from standard parts supplied in FAC universal machine construction kits.

60 THE IRON AGE, January 23, 1958

Trade mark

REPRO PRINT AB
Stockholm 1958