The warp passes over a wooden back roller, the gudgeons moving in ball bearings. The warp beam brackets are adjustable to suit the kind of cloth being woven.

The more tender warp requires that the top of the roller be at the same height as the breast beam. If it be a warp faced cloth, woven right side up, the roller is placed an inch or more lower than the breast beam to give the most tension where there is most warp. It is placed higher than the breast beam for weft faced cloth. The warp beam has fixed pulleys, and the bearer castings are slotted to take different lengths of warp beams.

Unique Take-up Motion.—This is on the right. It is run by a small tappet on the low shaft that operates a bowl on a horizontal shaft parallel with the outer loom frame. The shaft is given a rocking movement. At the front, it carries a one-armed lever to which is secured an upright rod that is fixed to a double curved lever seen in the illustration. On the upper surface of the top slotted lever is a numbered brass plate which indicates where the upper rod has to be fixed for the loom to put in the required picks per quarter inch. If set at its outer limit, it gives 7 picks per quarter inch, but at its inner limit, it puts in 35 picks per quarter inch.

The upper rod at the top is screwed to a catch plate behind the ratchet wheel. Inside, the plate has a semicircle of 21 radiating teeth that mesh with a full circle of radiating teeth on the ratchet wheel. When the catch plate is drawn downward, the teeth recede, but when pushed up, all the teeth advance, and turn the ratchet wheel to let off the warp. The ratchet wheel is loose on the shaft, but is made a fixture by a pin on the brake wheel entering a bore in the hub of the ratchet wheel. The brake wheel has a smooth surface, and is made a fixture to the shaft by a couple of locknuts. Resting on it is the brake that arrests excess movement of the ratchet wheel.

The brake has a lower leg, and to this is fixed the spring that keeps the brake in contact with the brake wheel. When the cloth needs adjusting, the lower arm is lifted, pushed back a little, and placed on a bowl for the purpose, the brake stud being long enough. Before the loom is set in motion, the brake has to be placed in action. The hand-wheel is on the same shaft as the worm that operates the large wheel on the take-up roller. The worm is covered by a plate to prevent smearing.

A small worm at the end of the take-up roller shaft, turns a numbered indicator plate that registers the amount of cloth woven.

Box Movement.—The boxes are controlled by the back four dobby jacks, the two back ones working the boxes on the right. They influence the two levers seen jutting from the upper loom frame. To these levers, chains are attached that are secured to right-angled levers below. When the inner lever is raised, the end of its vertical arm applies pressure to a plate that has five cogs on its rim. These are made to contact with a wheel in front that has two sets of four teeth and a double tooth between each set, that ends the turning. On turning, they rotate an eccentric connected to the rod that lifts the boxes, and in this way, the second box is raised to be level with the shuttle race.

To lift the third box, a similar mechanism is used, but the cogged plate is moved outwards. The fourth box is lifted when both cogged plates are brought into action at the same time.

If the box has to remain stationary after being lifted, the cogged plate or plates have to be moved out of contact with the front wheels, for the next half turn would lower the boxes.

There is an escape motion on the box rod, so that if the shuttle is caught between shuttle race and dropping box, the box rod is liberated, and damage avoided.

The meshing of the teeth begins when the crank is at its top centre, and ends when the reed has receded $1\frac{3}{8}$ inches from the cloth.

Style of Boxes and Shuttle Checking.—The box shelves are made of mild steel, and are cut diagonally at the box mouth, and are also well rounded off to avoid shuttle chipping. There are two swells to each box, the inner one giving the initial check to the shuttle and lifting the stop-rod tongue. The outer swell assists in the final check, and by means of an attendant easing motion worked from the crank arm, relieves the pressure on the shuttle when the pick is about to start. This easing makes pickers and tappet noses last longer. The shuttle is also given a running check, the amount being regulated by a stud on a slotted casting on the breast beam.

Take-up of Cloth.—Contrary to most looms, the breast beam is wood, but on its outer edge is a steel bar. From here, the fabric passes down to the rubber covered take-up roller, but can be covered with emery cloth if preferred. It has a circumference of 30 inches, and has a good grip of slippery textures. There is only a space of four inches that is bare of cloth. The fabric passes to the back of the roller and then over a steel bar in front. From this, it descends to pass in front of a lesser steel bar and then goes to the cloth beam. The last named is turned by a train of wheels, the driver being on the shaft of the take-up roller. On the inner side of the cloth beam wheel is a strong spring that imparts slip to the beam to prevent a too tight winding.

The reed space is 48 inches, and can be made fast or loose in structure. If the latter then the suspended rods seen in the picture are made use of, and a rolling motion imparted to the beat up of the weft.

The driving can be by fast and loose pulley, or by friction pulley, or by the very popular V-rope drive. The speed of the loom is 160 picks per minute, and the reed space 48 inches.

COMMON FAULTS IN WEAVING RAYON.

Though many improvements have been made in making rayon, it still remains the most sensitive yarn to wind, warp, weave and dye that textile commerce has to deal with.

At every stage, it must be subject to a minimum amount of friction and stretching, though spun rayon has more latitude than filament rayon. Woven rayon has similar faults to other yarns, but others are peculiarly its own. The chief faults are alphabetically arranged.

Barry Places.—These mainly due to erratic turning of warp beam. Collars or pulley to be free from rust, and ropes frictional surface rubbed with French chalk. Pretreated before commencing last, or last two pieces. Old ropes taboo, as frictional surface much enlarged.

In Fig. 450, and within a cloth space of 1½ inches, are three light marks that cannot be remedied if passed forward. If picks are extracted, a starting mark will be made, and the area of extracted picks liable to take a deeper dye.

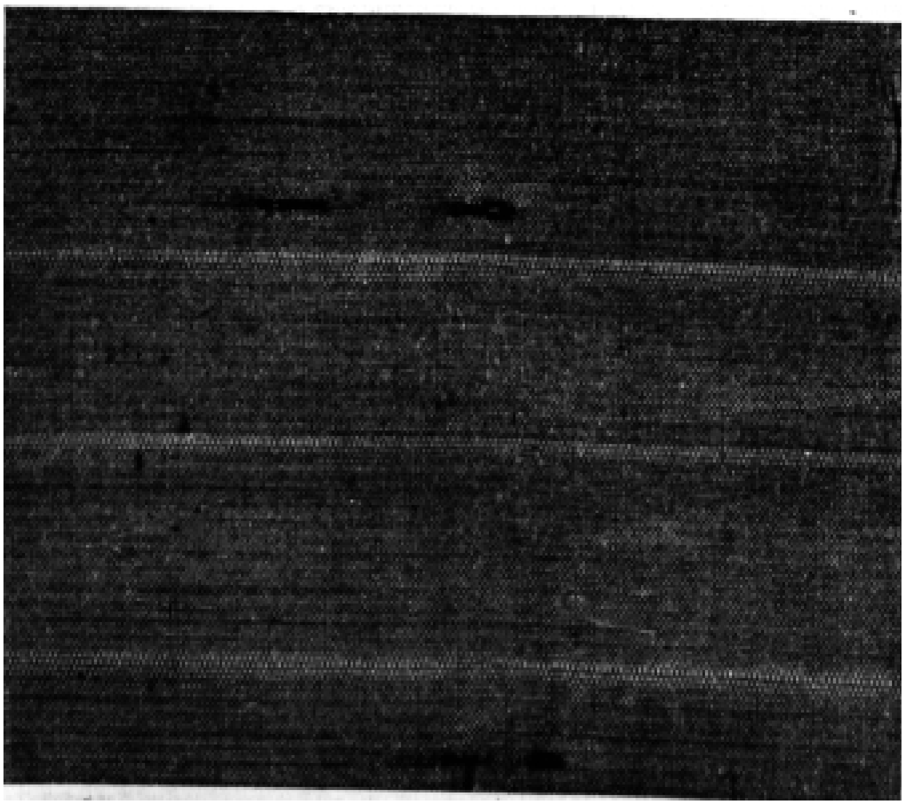

Fig. 450. Light Places.

Bright Picks.—Not all these made in loom. Brightness due to stretching beyond power of recovery. In loom, a spot of glue inside shuttle, or fur a little undone, or knots on yarn catching coils unwinding may unduly stretch yarn. A shuttle spindle too low, or a rough picker are weft stretches.

Broken Threads.—There are singles, groups, and traps. A smash is seen in Fig. 451 and suggests an accident, perhaps due to a weak spring in the shuttle, for in

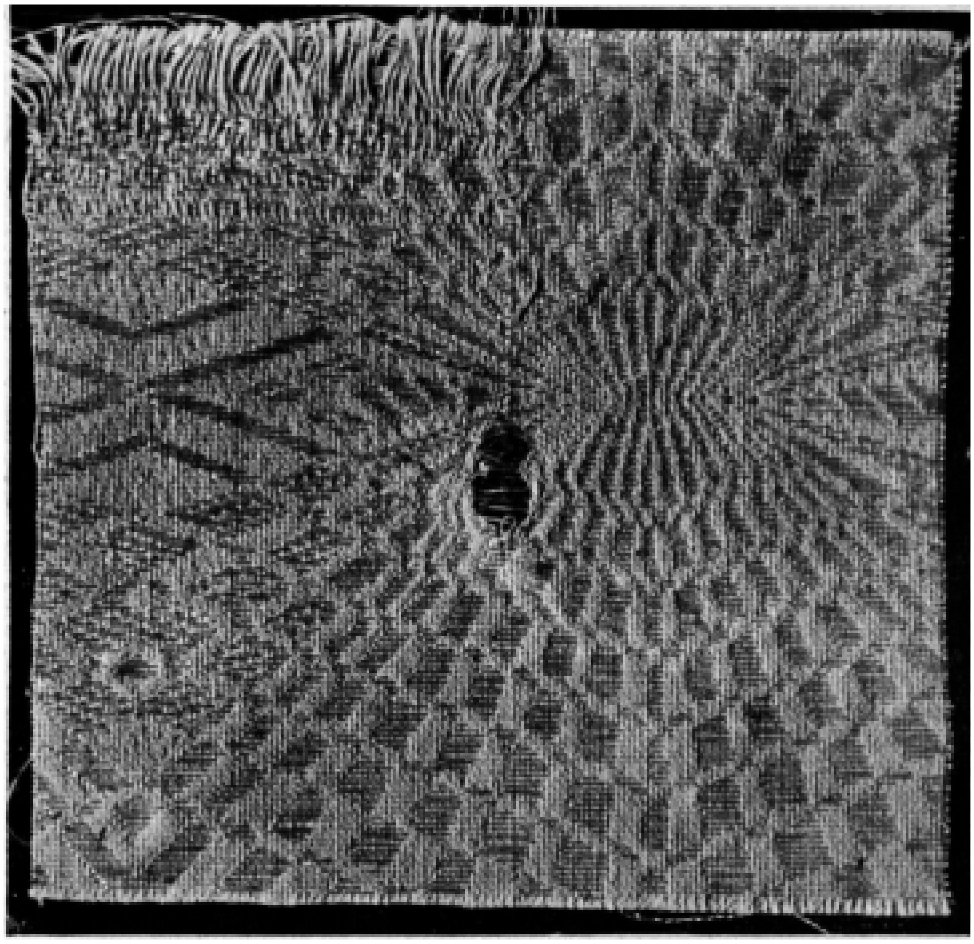

Fig. 451. Shuttle Trap.

centre of cloth, part of a paper tube is embedded. All shuttles to be used should be tested by overlooker before starting to weave a fresh warp. Chipped shuttles, a loose tip, broken picker, worn healds, shaft down, chafed threads, poor grip of temple, weak places in threads, are all damage makers to warp.

Buttons.—Mostly made on filament rayon. By chafing with rough reed, or threads too low on shuttle race, or worn healds, the broken filaments are pushed back by reed, and form lumps on threads. If buttons numerous, the warp has to be drawn forward, and buttons threaded through reed, and a fresh start made. If shafts used, the threads on them to be examined in relation to shuttle race. Worn swansdown or corduroy to be replaced.

Cockled Places.—Some fabrics purposely woven to produce them. Unwanted ones made by sections in jacquard fabrics by weaves closer than others. Others made by stretching, as when strips of cloth or starting canvas wrapped round take-up or other rollers.

Cracks.—These formed by slack crank arms. Left in cloth if weft fork not in order when weft fails. If crank worn oval it cannot be properly cottered, and requires a new one or new ends.

Creases.—Strictly taboo for rayon. Iron breast beams bow forward in centre to spread cloth, and smoother behind take-up roller bows backward for same purpose. This not possible with felt-covered roller. In some looms a wooden roller used over which cloth passes before reaching cloth roller. This thickest in centre.

Curls.—Made when shuttle fails to control weft. Shuttle bouncing back in box. Close weaves timed sooner to trap weft earlier.

Though not very distinct, what appears as black dots in one piece are curls, and 15 defective picks in that small area. Pairs or groups of shuttles to have same amount of tension for same counts of weft.

Dirty Weft.—For rayon, soiled weft not to be used. When dirtied during weaving, shuttle box, or shuttle block had surplus oil. Also by weft contacting with picker spindle or buffer. Weft to be confined to shuttle. Picks of dirty weft in Fig. 452. Buffers on plain looms to be made of layers of dry leather. These absorb oil.

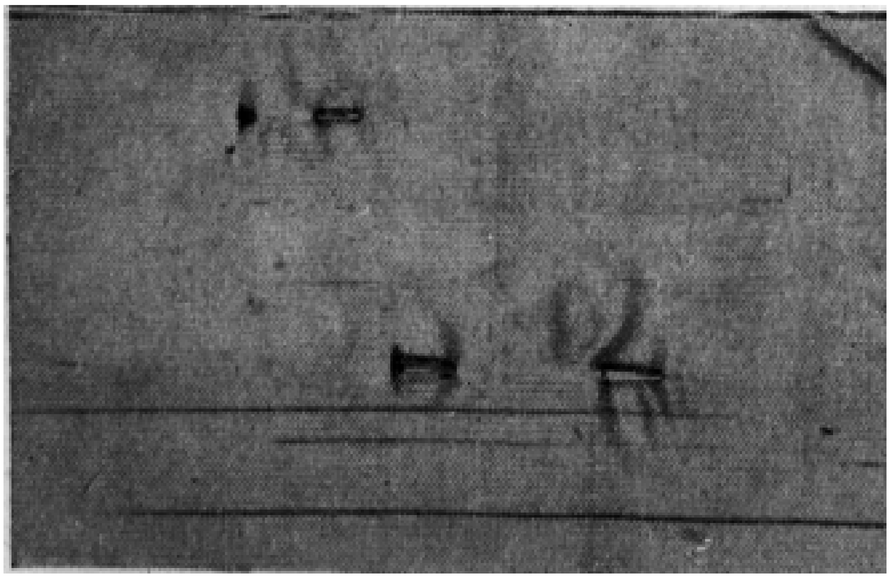

Fig. 452. Dirty Weft.

Oil Stains.—Cross rods in tappet looms, and jacks in dobby looms need tins with waste in to catch surplus oil. Jacquard weavers to wipe off all surplus oil. Overlookers repairing underneath loom have to be cautious. A bad case of soiling is at Fig. 453.

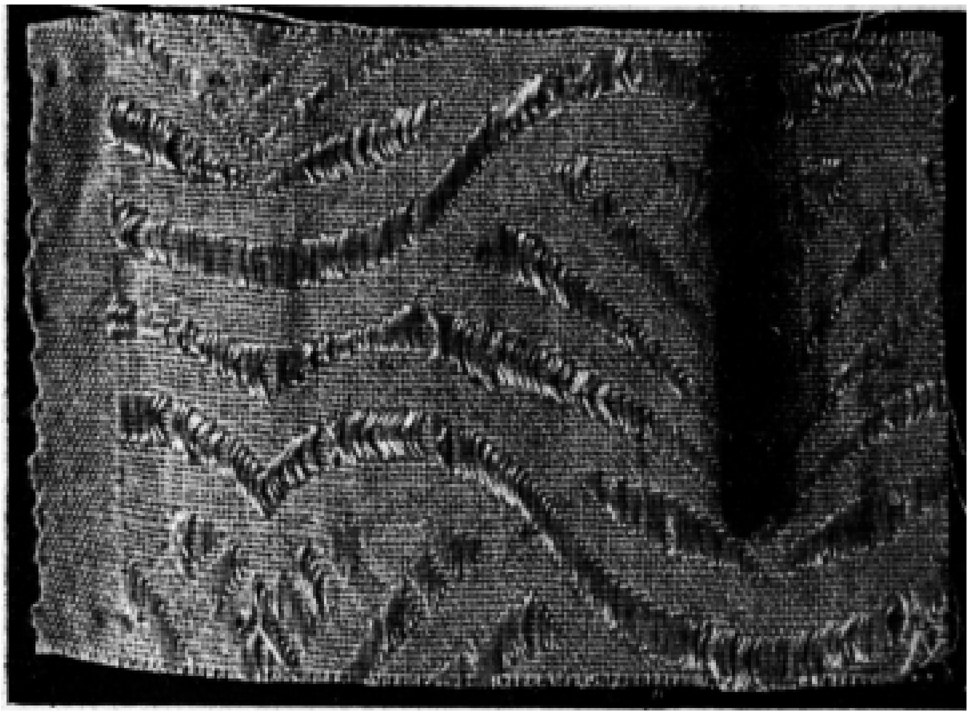

Fig. 453. Oil Stain.

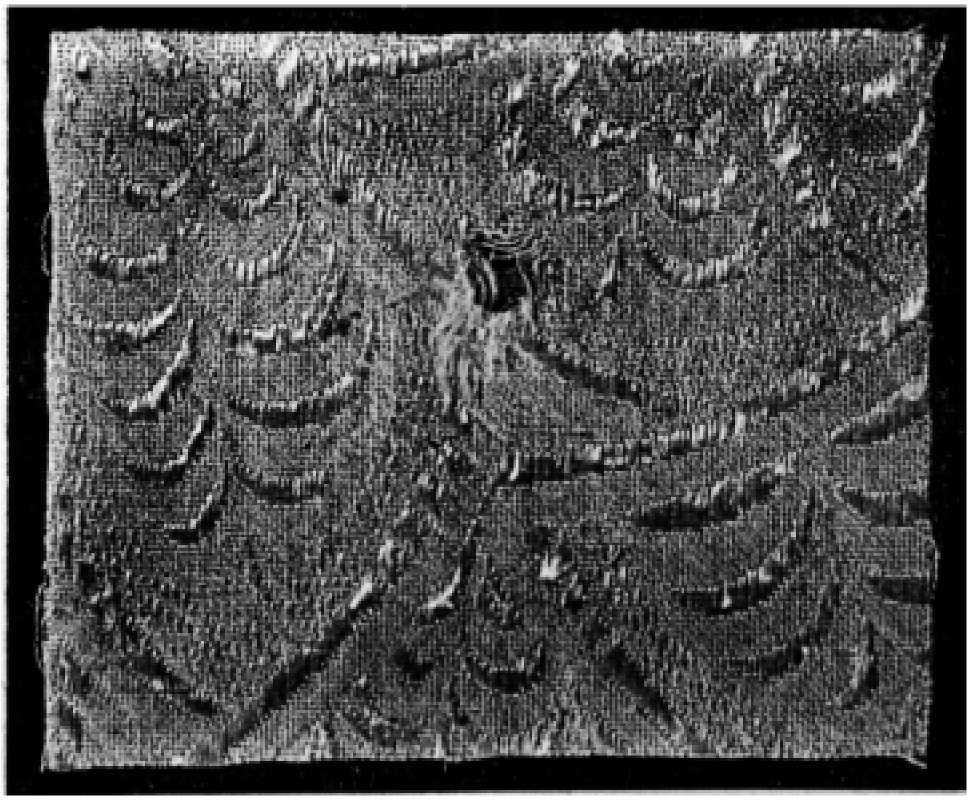

Fig. 454. Perforation.

Perforations.—Piercing of a piece may be made by a dropped shuttle, or bobbin of Northrop type. The bursting of an electric bulb, or the flying out of another weaver's shuttle, or the breaking of a tube or pirn. The example at Fig. 454 is what occasionally happens.

Picks Missing.—In plain weaving, a single missing pick makes a double one. This is seen in Fig. 455. If weft fork not in order the loom continues to run, and if a long trail of weft is left outside shuttle it may catch, and loom continue to weave. A good working plan for overlooker is to overhaul weft fork when loom awaiting a fresh warp. (*See* Hudson's first pick stop motion). Page 313.

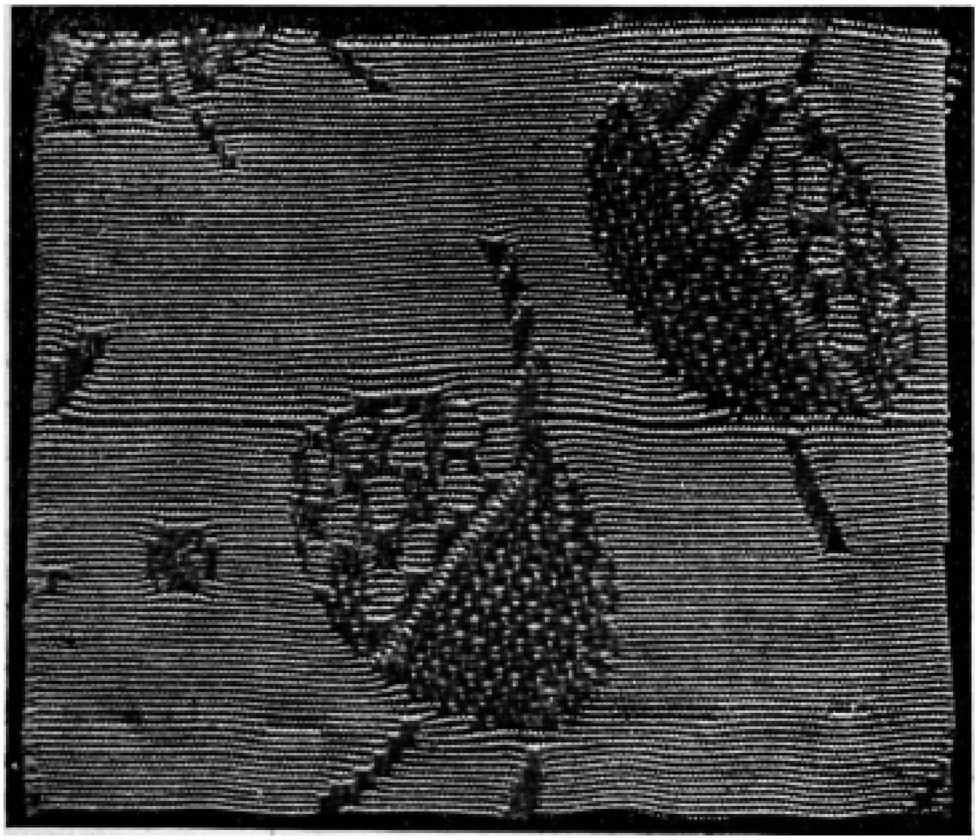

Fig. 455. Missing Picks.

Reed Marks.—Most rayon warps of fine denier woven in all metal reeds. With these the shuttle not to be thrown through shed by hand, but sent through by picking strap and by easing box swell with crank at back centre. Unwise to leave shuttle on cloth, or divide reeds with finger nail. A fine hook for threading. Weavers to beware of dropping bobbins. When reed injured, loom to stand until repairs carried out. Reeds to be protected from rust.

Set-up Places.—These left in cloth after lagging back or combing out. Rayon warps the most difficult in this respect, and only experienced weavers to undertake it.

Difference between correct and incorrect is very small. Both spacing and tension to consider. In try out, the reed not to contact with cloth fell until crank at dead front centre.

Selvedge Faults.—Selvedges may be woven with same weave as ground, and from same beam when it is even like plain, and 2 and 2 twill. If warp or weft faced, threads woven from flanged cheeses, and front separate shafts when possible. The weave different, to make a flat effect as 2 and 2 warp rib. It prevents piece rolling at edges when liberated. Shuttle to be tensioned alike to avoid waviness. Example at Fig. 456.

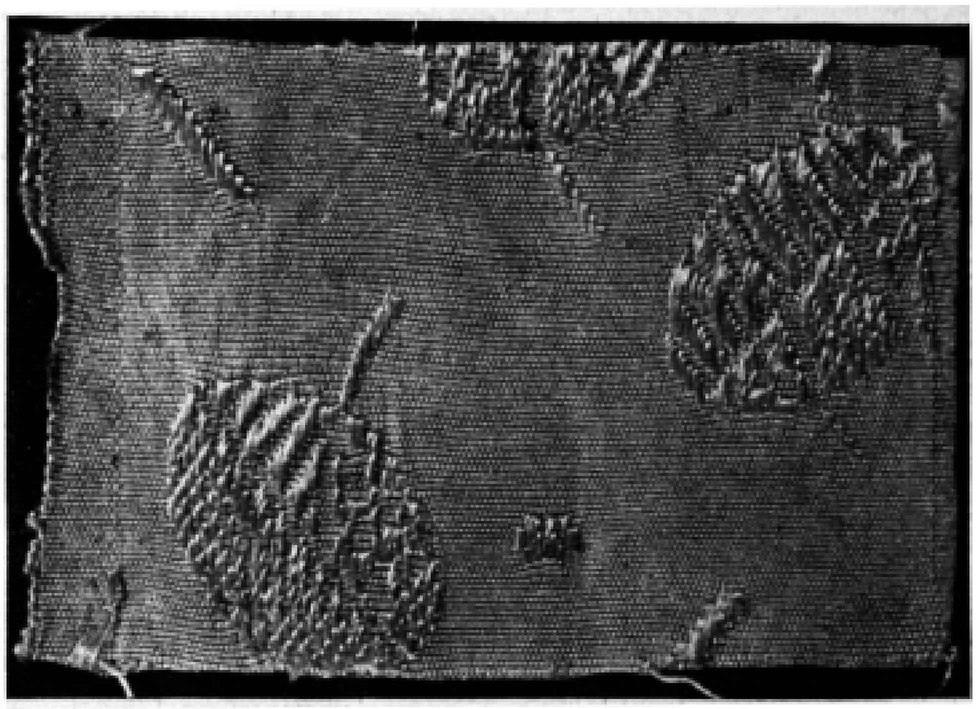

Fig. 456. Selvedge Fault.

Cheese Winding for Special Selvedges.—If selvedge threads are thicker or thinner than ground warp, they are

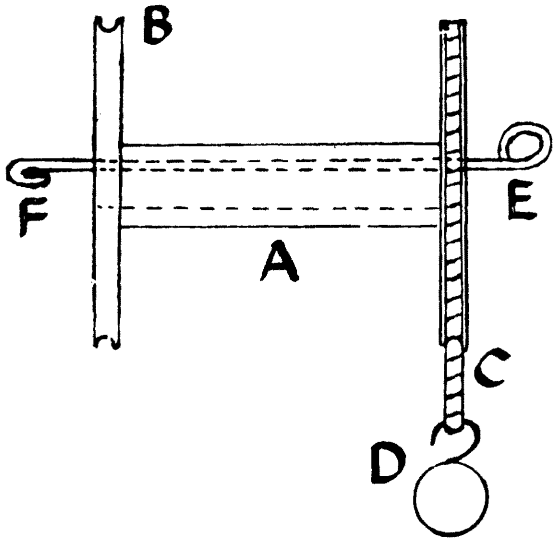

Fig. 457. Selvedge Bobbin Cheese.

wound off a separate cheese and weighted. The most handy kind of cheese is a double flanged bobbin like Fig. 457.

A bobbin, B grooved flange with brake band C and weight D. Looped wire E turned down at F to prevent band slip. Relative speeds of warp and bobbin are calculated. Both sets of threads marked a yard from cloth, and measured when first mark about to be woven in. In winding on cheese, threads have to be moved " to and fro," and so does not give equality of tension in unwinding. Fig. 458 is another

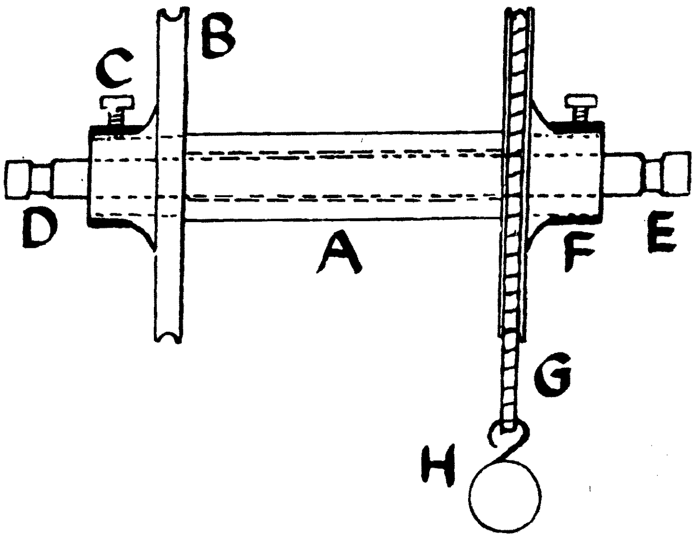

Fig. 458. Metal Selvedge Cheese

style made of metal. A, bobbin shaft, F and B grooved flanges setscrewed at C. They can be set to width required for straight winding and weaving. D and E are grooves in bearer shaft to hold suspension bands. G, brake band, and H, weight.

Edge Threads.—For plain weave the outer thread may be three-fold, and the next two-fold. For 2 and 2 twill, it is much the same, but for 2 and 2 hopsack, a catch thread at the open end is needed. If a thicker count or denier is used, the threads in each reed are decreased. For 8 shaft sateen, the selvedge can be woven

$$\text{Up} \quad \frac{3 \;\; 2 \;\; 3}{3 \;\; 3 \;\; 2} \quad \text{Down}$$

Faulty Selvedges.—Fig. 459 is a weft striped fabric. The warp is three-fold acetate and twisted, but the weft is viscose and twistless, with 36 threads and 50 picks per inch. White ground woven plain, and blue stripe is 8 end sateen, and weaves wavy edges. Selvedges weave plain, and woven by a selvedge motion. The four outer threads are double ones. The selvedge is too slack, and is bowed upward.

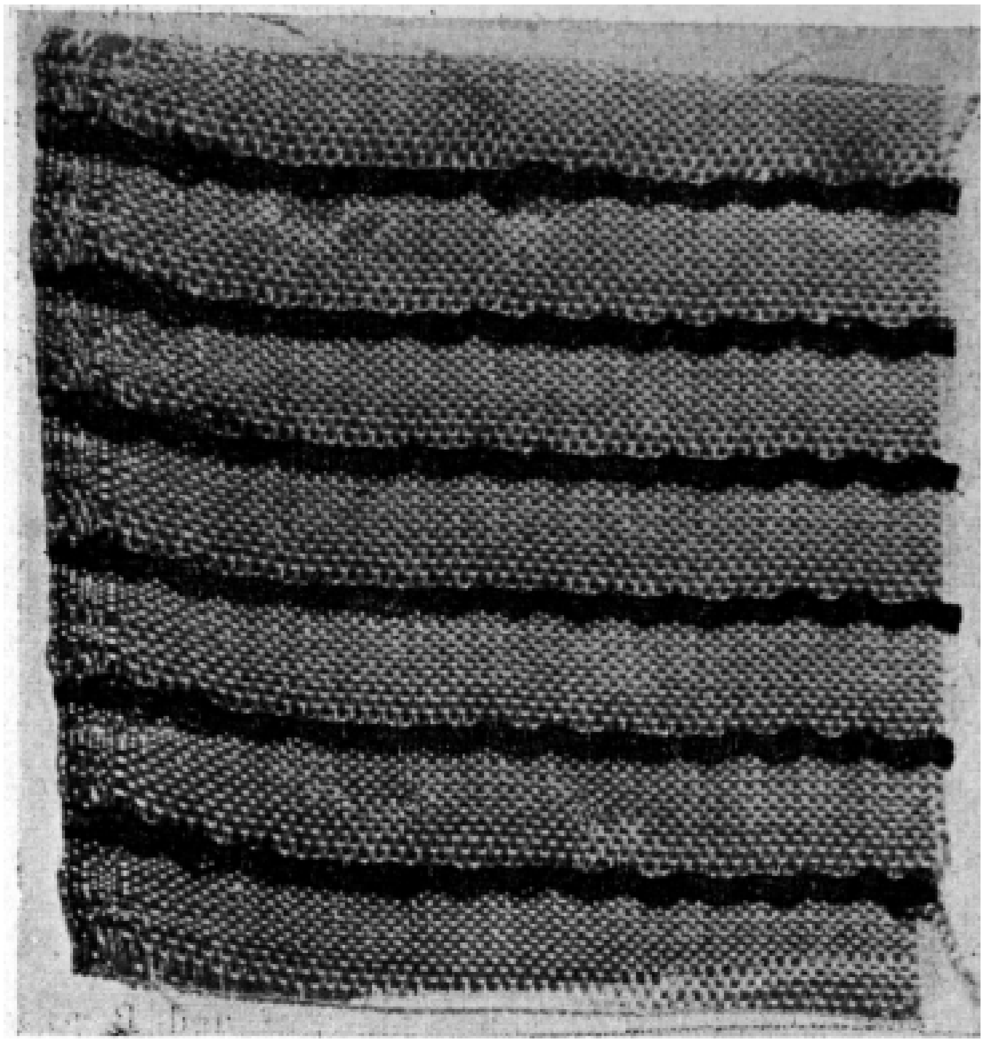

Fig. 459. Slack Selvedge.

Fig. 460 is another weft striped pattern with 36 threads and 50 picks per inch. Warp three-fold acetate, but blue and gold weft twistless. Ground, plain weave, but narrow blue stripes are 3 and 1 weft twill. The fancy weave a diamond pattern. When weft changes, loops form at selvedge. In broad blue stripe, the depth extended, but in broad gold stripe it is contracted owing to weft drag. Construction of selvedge the best of a series of six patterns. Outside thread made with two three-fold threads, the next three are three-fold threads, and those that follow are two-fold.

Shuttle Marks.—These mainly made in rayon crêpe weaving. When shuttle or pickers are worn, or the reed not straight, or delivery of shuttle not correct, the shuttle wobbles through shed. On entering, but more so on emerging, more force is placed on warp, and the increased friction leaves a mark that shows when fabric finished. The faults suggest the remedies.

Snarls.—When weft hard twisted, it is liable to double on itself as soon as slackened, and at worst when new spun.

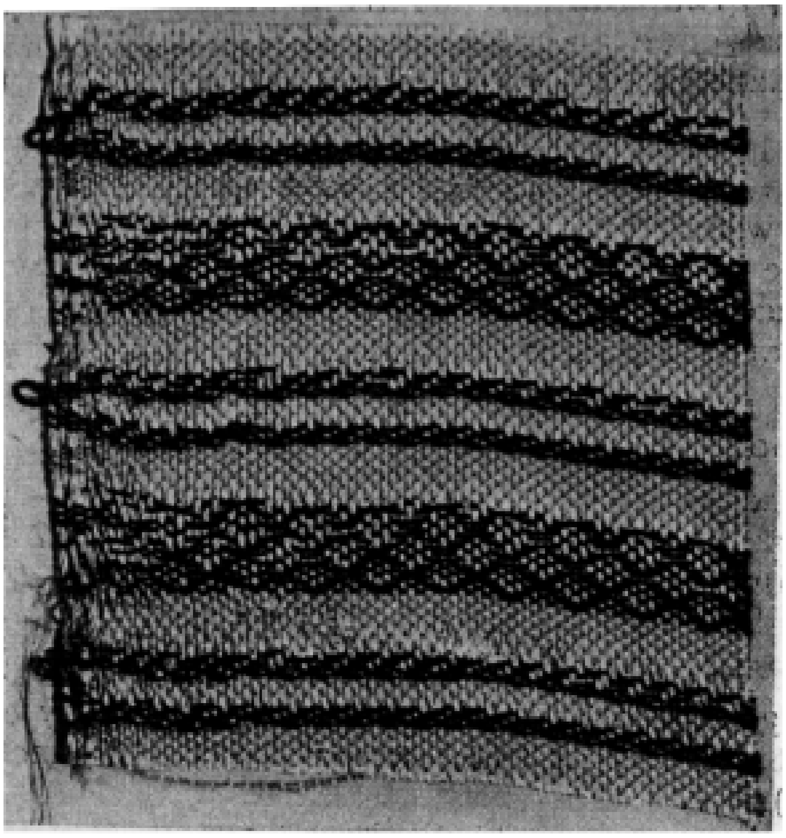

Fig. 460. Looped and Uneven Selvedge.

As a snarl makes three thickness, the measures taken to avoid them are:—

1. By naturally conditioning it in a cool place.
2. By steaming it.
3. By better control in shuttle.

Trailing In.—When right and left twist weft are used, the one essential is to keep them as separate as possible between mouth of box and selvedge. The appropriate placing of swansdown or corduroy will improve matters. In drop

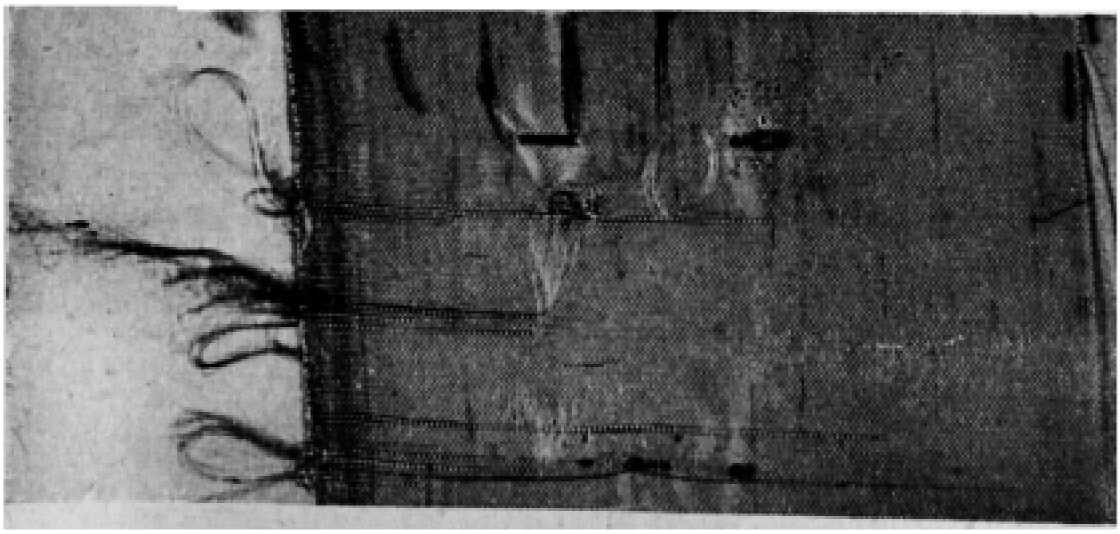

Fig. 461. Weft Trailed into Cloth.

box work, groups of threads are arranged to work midway between selvedge and box mouth. The mess that trailing makes is seen in Fig. 461. *Refer* Page 407.

Wrong Patterns.—When the elasticity of rayon yarns are improved, there will be a greater demand for more elaborate weaves, with a probable increase of mistakes. The beautiful effects of colour and weave, and diamond patterns, artistic jacquard designs, and ingenious crossings of gauze will call forth premature measures against wrong patterns.

Here is an actual wefting plain for a drop box or a circular box.

Rose pink	68	—	—	—	—	—	
Saxe blue	12	—	—	—	—	12	
Bright yellow	4	—	—	—	4	—	144
Light red	8	8	8	8	—	—	
Peacock green	4	4	4	—	—	—	

In lagging back or combing out, it is a very easy matter to have too many or too few picks in the 68 section. (*See* Fig. 443).

DEVELOPMENTS IN NEW YARNS.

NYLON.

By research carried out by *private* enterprise, a number of highly important developments have taken place in recent years. Rayon has already received attention. Weaving overlookers are not interested in the fancy names used in chemistry, but have to take an interest in the yarns placed in the looms under their charge, and the best means of management.

There are great possibilities that nylon will be the most outstanding discovery of the chemical laboratory for a long time ahead.

Its Discovery.—Carrothers was one of the cleverest textile chemists employed by Messrs. du Pont de Nemours and Co., Wilmington Works, Delaware, U.S.A. It was this gifted man who discovered the combination of elements that created nylon, and laid the foundation for its progress.

On February 8, 1935, was the first time that two substances were condensed under his own special conditions that formed the polymer that made the new filaments. The two substances were hexamethylene diamine and adipic acid. The first is a coal tar product, and the second is made from benzene. Nylon is not therefore dependent on wood pulp and linters like rayon, but is dependent on coal, air and water. Carrothers and his staff began their investigations in 1928, but the vital discovery was made seven years later. To attain commercial success, it took another three years.

Process of Production.—Instead of forming a viscous solution and forcing it through a spinneret into a coagulating bath as for rayon, it is made by forcing a molten substance through a stainless steel spinneret with fine bores. The fibres are formed by becoming solid, and are wound on to a bobbin, and later, are drawn out to about four times its original length. This reduces their diameter, but they are permanent.

Its Properties.

Strength and Elasticity.—Nylon used for manufacturing has a dry strength of 5.0 grams per denier, and 4.5 grams per denier wet strength. The chief reason for its strength is its crystal structure. Its recovery after stretching is shown from tests. When stretched and held for 100 seconds, it recovers itself in 60 seconds. When stretched from 2 to 8 per cent. it recovers 100 per cent. When stretched 16 per cent. it recovers 91 per cent.

Inflammability.—When a flame is applied to nylon, it does not burn in the ordinary way, but quickly shrinks into a small hard ball. It is much safer for outer wear than either rayon or cotton. Its melting point is 240° C, which is well ahead of any heat required for laundering.

Water Repellent.—It resists moisture much like a mackintosh, and does it without dope. Dyes used for colouring are those of the acetate type, though others are used in modified form. Nylon is therefore better for outer wear than under wear; as it does not absorb sweat, or very little.

Lustre.—It does not possess the dazzling sheen of rayon, but is more like silk with its pearly appearance. It is kinder to the vision of operatives than lustrous rayon.

Immunization.—It is quite free from bacteria, and mildew does not affect it.

It is also impervious to the attack of moths, and an excellent covering for the storage of expense furs. It is not adversely influenced by household chemicals.

Static Electricity.—It cannot be woven without being sized and lubricated. It is not sized to increase strength, but to bring its static electricity under control. If dry threads or a hank be placed between the hands and then let slack, they balloon remarkably. If the hand be wetted and passed down the threads, they are limp immediately. The sizing and lubrication has to be done before warping, and lubrication gives it a better passage through the loom.

Lack of Warmth.—In keeping with rayon, it is cold to the touch. Though it is likely there will be a great demand for nylon stockings, because they keep their shape, and will be fashionable, they are not suitable to be worn next the skin as they become clammy.

Weaving Conditions.

Nylon is so strong as to have a cutting action on parts over or through which it passes. A wooden back rest would soon be grooved, and also lease rods. A hardened steel roller whose gudgeons turn in ball bearings, and tin covered lease rods are essentials. Heald eyes have to be metal and not wire. The shuttle race to be covered with corduroy, not as a soft bed for warp, but to prevent the grooving of the shuttle race. Owing to the fabric being very slippery, the take-up roller is covered with emery cloth of the coarser kind

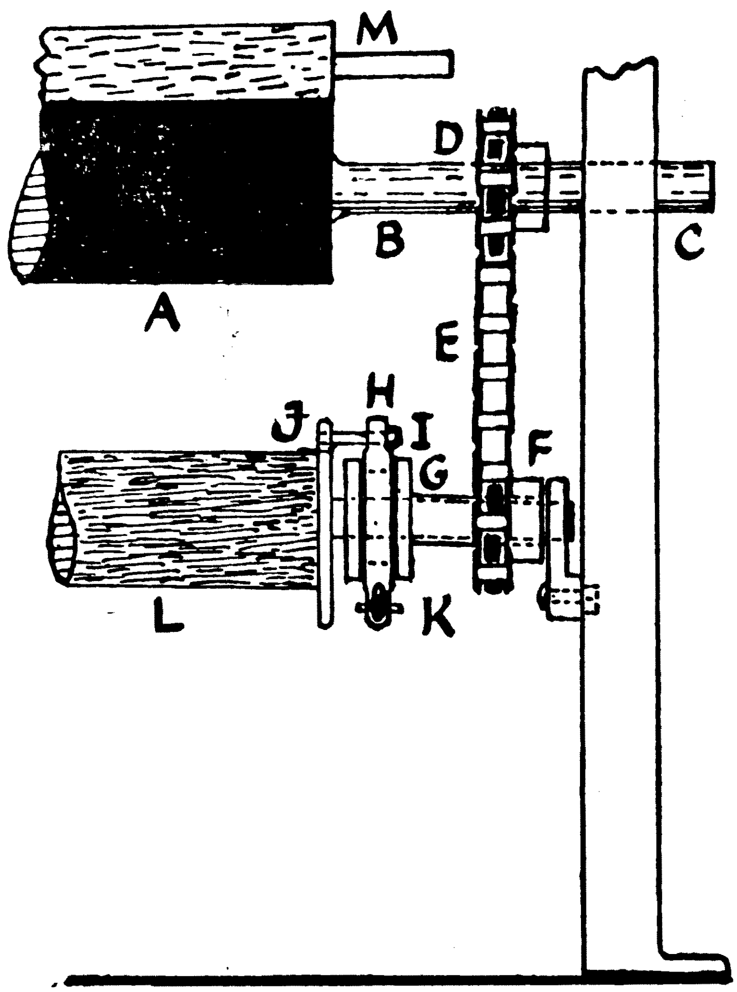

Fig. 462.
Take-Up for Nylon Cloth.

for better grip. It is unwise to have the cloth roller turned by friction, for two layers of slippery fabric are against good cloth winding. The cloth beam is reliably turned by sprocket wheel and link chain provided with a clip motion. This is seen in Fig. 462. A is take-up roller, B shaft, C place for take-up wheel, D sprocket wheel, and link chain E connecting it to sprocket F, fixed to sleeve that carries friction pulley G. On pulley is friction clip H carrying pin I that penetrate a bore in cloth beam flange J. At base of friction clip is wing screw K, to regulate cloth winding on beam L.

To assist grip of cloth, a felt covered roller is placed at M on top of take-up roller A, and cloth passes over it on way to cloth beam. The gudgeons of felt roller turn in open slots so that starting knots can pass underneath.

Wefting.—The slipperiness of nylon weft is modified by its preparation. The interior of shuttles are lined with fur like opossum. Weft trap shuttles made by Messrs. Pilkington of Heywood, and Messrs. James Nelson of Nelson, are both valuable aids for braking weft, but are even more suitable for rayon. (*See* final chapter on " Shuttles for

Lancashire Looms) "). Lupton Bros. of Accrington, have made a special temple for weaving nylon. (*See* " Accessories "). Page 540.

Vinyon.

This is another far reaching discovery. It is made from synthetic resin. About the year 1934, Reid employed by Carbide and Chemicals Corporation, at U.S.A., found the true combination for making this yarn. In 1939, the manufacture of it was handed over to Messrs. Courtaulds branch in America. It is made from chemicals derived from acetylene extracted from the petroleum industry, or from calcium carbide derived from coal and lime. These are formed into vinyl chloride and vinyl acetate. When these two are mixed in certain proportions, and under certain temperature, they form the new fibre.

Process of Development.—At the time of writing, the proportions are 12 per cent. vinyl acetate and 88 per cent. vinyl chloride.

After this blending, the temperature has to be kept from 40 to 60° C for 72 hours. When preparing for spinning, the resin is dissolved in acetone to form the spinning mixture The preparation is then filtered, aerated and pumped through spinnerets. The acetone evaporates, but means are adopted for its recovery.

Threads formed by each spinneret is wound on a suitable bobbin. At this stage it is very weak, but when stretched under high temperature, its strength reaches 4 grams per denier, and are stronger when wet than dry. After stretching, it is set by heating under tension, the heat being from 90 to 100° C.

Properties and Uses.—In several respects it is like nylon, for it resists water, does not mildew, does not burn, is lustrous, and proof against acids. It does not harbour static electricity. When piece-dyed, it needs low temperature. Filter cloths and outer clothing for chemical workers are the nucleus that will be much extended.

Weaving.—It can be spun as fine as 8 denier, and by twisting threads together, can be made as thick as 5's cotton. The fine denier can be woven in a plain silk tappet loom, but the coarser kind would need a canvas loom. The general arrangements are as for nylon.

As an example of a heavier make of fabric the warp is three-fold. Each thread of the three-fold is two-fold, so that each individual thread is made with five threads. The final twist that binds them together has only four turns per inch. The counts are equal to 12's cotton. The weft is five-fold with little twist in each strand, but the final twist has 7 turns per inch. Counts, 5's cotton, and picks per inch 31. Weave plain. Cloth exceptionally strong, and its appearance like canvas.

"Fibro" and Casein Staple Fibre.

"Fibro" is filament rayon cut into definite lengths. Its denier and length is best for blending when it conforms approximately to those with which it has to be blended. Its natural origin is wood pulp, but improved by adding linters.

Casein has a protein base, and obtained by the chemical treatment of skimmed milk, and therefore of animal origin.

In appearance, it is much like wool, and far more so than rayon, nylon or vinyon. It is crimpy, in locks, has warmth, and a silky handle. Unlike wool, it readily catches fire, burns brightly for a short time, and on dying out, leaves a black ash. The smell after burning is like wool.

It has been made into two different deniers and staple lengths. One is 3.5 denier and 5 inches long, and the other 5 denier, and 6 inches long. They have been used in wool blends and also with viscose rayon. With either it has to be well blended. With wool, it increases the lustre, and the handle is smoother and silkier. When blended with rayon, it is more fibrous, but the fibres are so small and smooth as scarcely to be noticed.

When blended with viscose in the same threads, or warped separately, it produces a two colour effect with the same dye bath.

When a thread composed of "Fibro" and casein is flame tested, the "Fibro" rapidly disappears, but the casein fibre leaves a ghost thread of black similar to that of loaded silk.

ACCESSORIES.

Lupton's Temples.

The firm of Messrs. Lupton Bros., temple makers, at Accrington, Lancashire, are widely known, the firm having been founded in 1869. They have the patterns of 1,400 types of temples, many of which are in use, and meet the needs of every kind of woven structure.

At Fig. 463 is the " Revoleze " temple, which is being extensively used in the weaving of both cotton and rayon. There are two rollers, the ends of them being ball-shaped

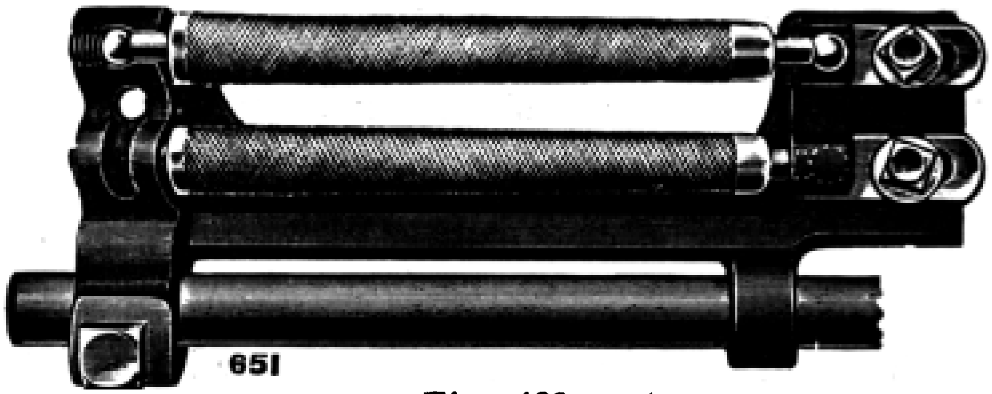

Fig. 463.
Lupton Brothers Double Roller Temple.

to produce the easiest movement. There are 41 small spikes in a row, and as there are 26 rows, there are 1,066 of them on each roller. The rollers at their inner ends rest in adjustable castings, and are set to give rotary freedom, but only give the slightest play laterally.

When found necessary, one or both rollers may be changed for fluted rubber rollers, or others that have spikes only to seize the selvedge. Ten different styles of rollers are made by the firm. The under side of the temple is open, and allows fluff and waste to drop to the floor. As shown, the frame of the temple fits on to a round bar, and is set by a setscrew. Its under side must clear the shuttle race, and the front of it be free from contact with the sley when the crank is in its full forward position. It must also be set so the whole of the spikes be in contact with the cloth as they revolve, without the selvedge turning over. The cap though not shown, covers the two rollers, and forces the cloth on to the spikes, and is held down by a setscrew.

There are right and left hand rollers, and their spikes should point away from the centre of the loom. Old and new rollers do not work well together, but if of necessity, then the new one should be placed nearest the reed. Glaze marks are caused by too much friction.

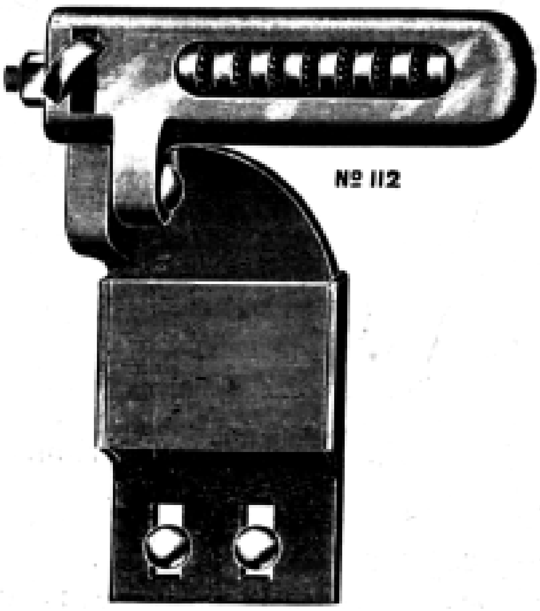

Fig. 464.
Lupton Brothers Ten Ringed Temple.

For stronger work, the 10 ringed temple with its swing cap is used. This is at Fig. 464. Its advantages, function, and setting have been fully explained in the chapter on "Temples." *Starting* Page 286.

Lupton's Nylon Temple.

This is an entirely new kind of temple that takes charge of the whole width of the cloth, and is made by Messrs. Lupton Bros., of Accrington.

Structure of Temple (Under Part).—This is at Fig. 465. The temple is usually made the width of the reed space, and a view of one end is given. A is a fixing plate bolted to a bracket on inner side of breast beam on narrow looms. Two are used, but for wider looms, more are required.

It is countersunk at B to receive the flat head of holding bolt for breast beam bracket. C and D are similar bolts that fix plate to under side of temple.

The rounded part of slot E is for stud to pass through, and slot F takes round body of stud. G is fixing bolt that sets upper part in relation to lower one. It is the round steel rod under which cloth passes after crossing the rounded lip at front of temple The steel rod rotates by the forward

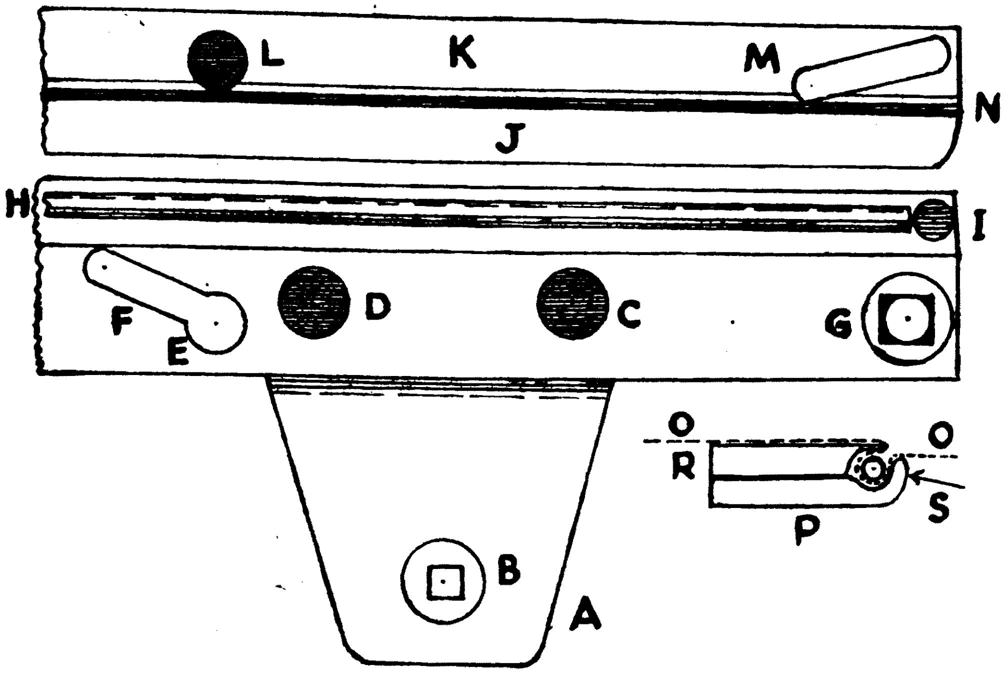

Fig. 465.
Lupton's Temple for Nylon.

movement of cloth. The ends of this part are stopped by plugs like I that keeps rod in position.

When the upper part in Fig. 465 is fixed in position a trough is formed for the steel rod. In all, and for narrow fabrics, there are six slots like the one at E and F, the distance between each being 6½ inches. The total length of temple is 41 inches, and total width, ignoring plate etc. is 1¼ inches. The slots incline at 20 degrees and length of each slot is 1⅜ inches. They enable the upper part or cap to be moved forward.

Structure of Temple (Upper Part).—The under part of upper section is at N, and for fixing, has to be turned over. At J is the thin part that acts as cover for steel rod below. It is only $\frac{1}{16}$ inch thick, but part K is ¼ inch thick.

At inner edge of thick section, a series of studs like L are riveted, the heads passing through the rounded part E of slot F in Fig. 465. At M is the slot by which cap N is adjusted. The shaft of setscrew G passes through it, and fixes it in its weaving position. When set, the top of the cap is flat, and both edges are rounded off.

Setting of Pitch (1).—The breast beam brackets must be carefully levelled so the temple itself is level before tightening bolt through plate at B, Fig. 465. If brackets not true the temple is tipped.

(2) The under side must be clear of shuttle race, and the top of tip be about centre of open sheds.

(3) Front of temple to be free of reed when crank at front centre. If set too far forward temple front injures

reed and cuts the warp. After setting, the temple is practically rigid. No run back of temple is needed, for owing to thinness and setting of temple the shuttle will slip over temple top in case of a trap.

Path of Cloth.—On leaving fell of cloth, the fabric O in small drawing, passes over lip of bottom part of temple at P, and around the steel rod S, rotating in groove made by castings P and R. It then goes over breast beam, and down to take-up roller. The roller may be covered with emery cloth or rubber. One made of rubber is 1⅜ inches wide, and its face is like rows of small buttons, and when placed lengthwise, they form twills to right.

To aid the grip on the cloth, a felt covered roller on top of the take-up roller is an advantage, but its gudgeons should be in open slotted castings, to allow starting knots to pass under. If the loom has an ordinary smoother, the cloth passes clear of take-up roller. *See* Page 537.

Additional Remarks.—On starting a warp, the cap and steel rod are taken off until the starting knots are wound beyond temple. The warp is then slackened a little, and the steel rod is then placed in its groove. The cap is then applied, and its nearness to the reed examined. In this make, there are no pins to damage, or cut threads and picks. What friction is applied is equally distributed across the face of the fabric, and is roller friction. The under side of the cloth contacts with smooth metal that does not injure the texture.

Mather and Platt's Weft Feeler Motion.

A weft feeler motion has an advantage over a weft fork because it comes into action before the weft fork can act when the weft is almost exhausted, and so prevents light places being made in the fabric. A weft fork has an advantage over a weft feeler, for it stops the loom when the weft breaks. One motion therefore supplements the other. A weft feeler is needed more than ever with weavers having to attend to more looms.

The following gives a description of Mather and Platt's weft feeler motion. It is perhaps best explained under the following headings.

Preliminaries.—Before the motion is fitted, an oblong hole 1½ inches long and ⅜th inch deep is made in the box and shuttle front, the place being centrally found by placing the shuttle fully in the box. It should then be ⅞th inch ahead of the inner end of the bobbin head. The next move is to take off the weft hammer, and screw in a pin in the outer front part of the head.

Setting.—The tumbler weft fork is then taken off, and the tripping lever is slided on to it. The final fixing of it can be left until the feeler motion at the opposite end has been adjusted. A right angled casting is now bolted to the pivot of the knock-off lever to which the weft fork is attached. The feeler is then set in two ways.

(1) By a steel clamping block which is secured to the vertical part of the right angled lever mentioned, the feeler being placed directly opposite the side centre of the bobbin in the shuttle.

(2) By means of a clamping screw on the shaft of the feeler, it is set just clear of the bobbin in the shuttle when the crank is at its dead front centre.

Having secured these important parts, the tripping lever may now be set so the curved front of it is directly opposite the pin at the side of the weft fork hammer when the feeler is stationary.

Negative Action.—When there is plenty of weft on the bobbin, the feeler is pressed back every time the shuttle enters the box at that end of the loom. On being pressed back, the clamp screw on the shaft of the feeler lifts a curved finger that rests upon it. The curved finger is setscrewed to the connecting rod which is twisted in consequence. As the trip lever is on the same rod, its curved front part is raised above the pin on the side of the weft fork hammer, and the loom continues to weave. The feeler is pushed forward by an open spiral spring attached to the curved finger which presses it against the clamp screw.

Positive Action.—When the weft is almost spent on the bobbin, the feeler remains stationary, and as the other parts also remain inactive, the trip lever is pushed back by the movement of the weft fork hammer, and as this forces the setting on handle out of its notch, the loom ceases to run.

Mather and Platt's Weft Hammer Knock-off Motion.

The latest ideas are revealed in Fig. 466 and 466a. The new knock-off is independent of the weft feeler, and is worked entirely from the warp stop motion.

Bracket 1, Fig. 466, secures the motion to the knock-off lever 2, the two being held together by the nut and set-screw 3. When the knock-off is not in action, lever 4 rests in the socket on the upper part of lever 9. This position keeps the knock-off rod free from the hammer head 7, and

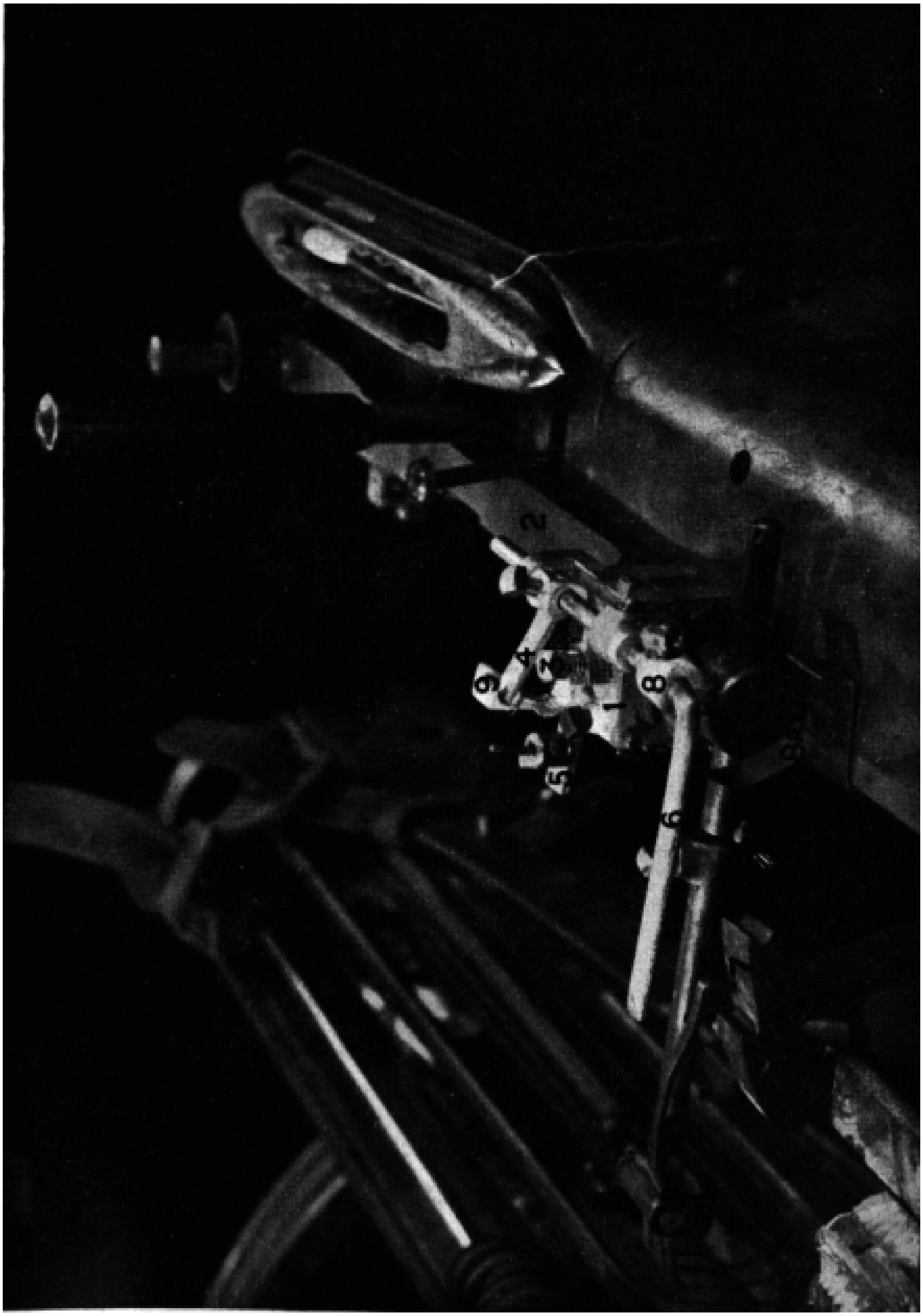

Fig. 466.
Mather and Platt's Weft Hammer Knock-off Motion.
Position for Weaving.

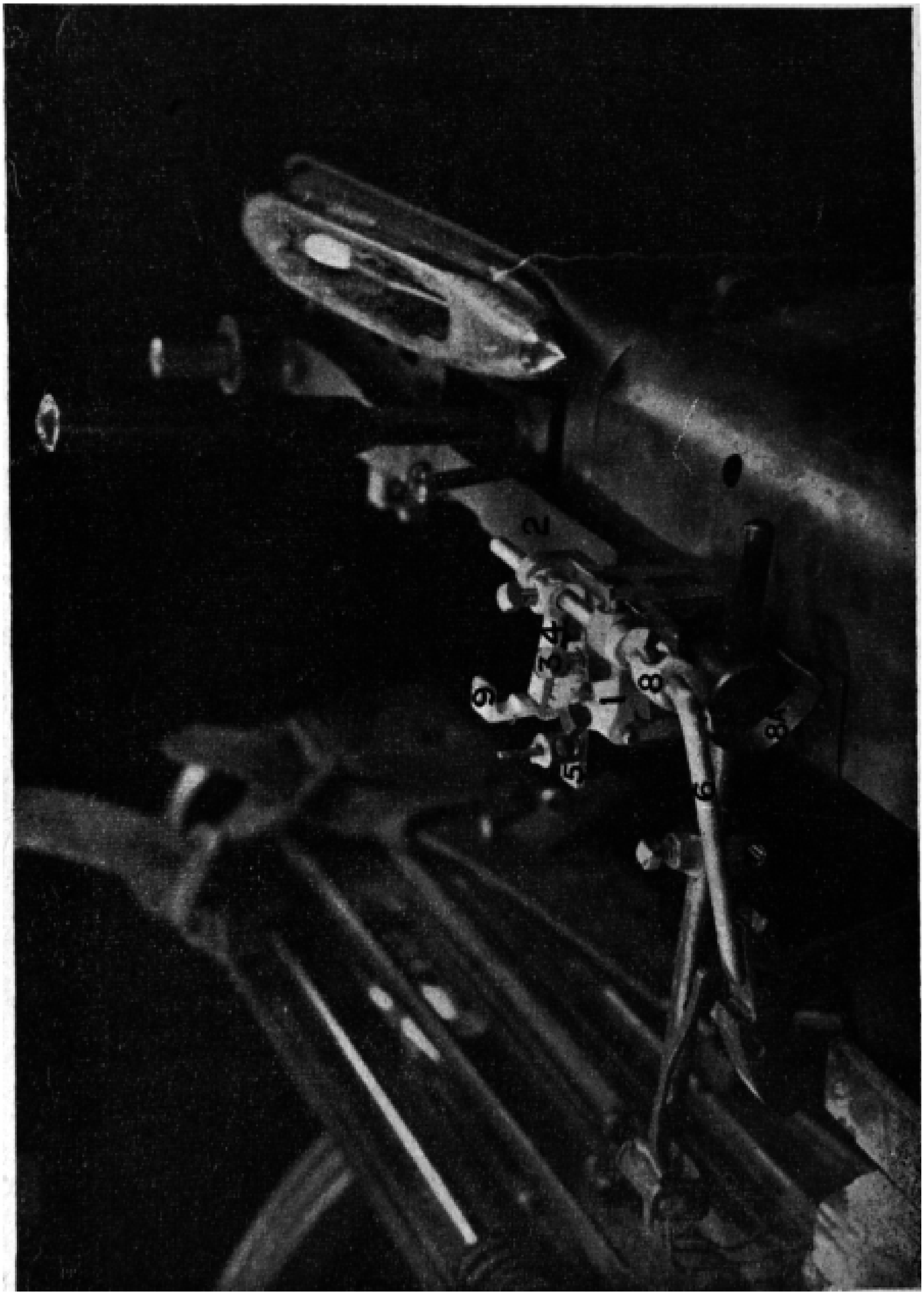

Fig. 466a.
Mather and Platt's Weft Hammer Knock-off Motion.
Position for Stopping Loom.

is the normal working position. When a warp thread breaks, the lifting lever on the warp stop motion operates lever 5, and drops finger 4 from the upper socket on casting 9, and places it in the bottom one. By this movement, rod 6 is dropped on the weft fork hammer as shown in Fig. 466a, and as soon as the hammer moves backward, the setting on handle is forced out of its notch, and the loom ceases to run. When this movement takes place, the boss 8 which is set-screwed to the same bar that forms the knock-off finger 6, comes in contact with the inside of the breast beam by means of the spring 8A. This contact raises rod 6 as soon as the weft fork hammer releases it, and remains free of the hammer until another end is broken.

The new knock-off stops the loom with the shuttle at the starting handle end of the loom. It can be fitted to right or left hand looms.

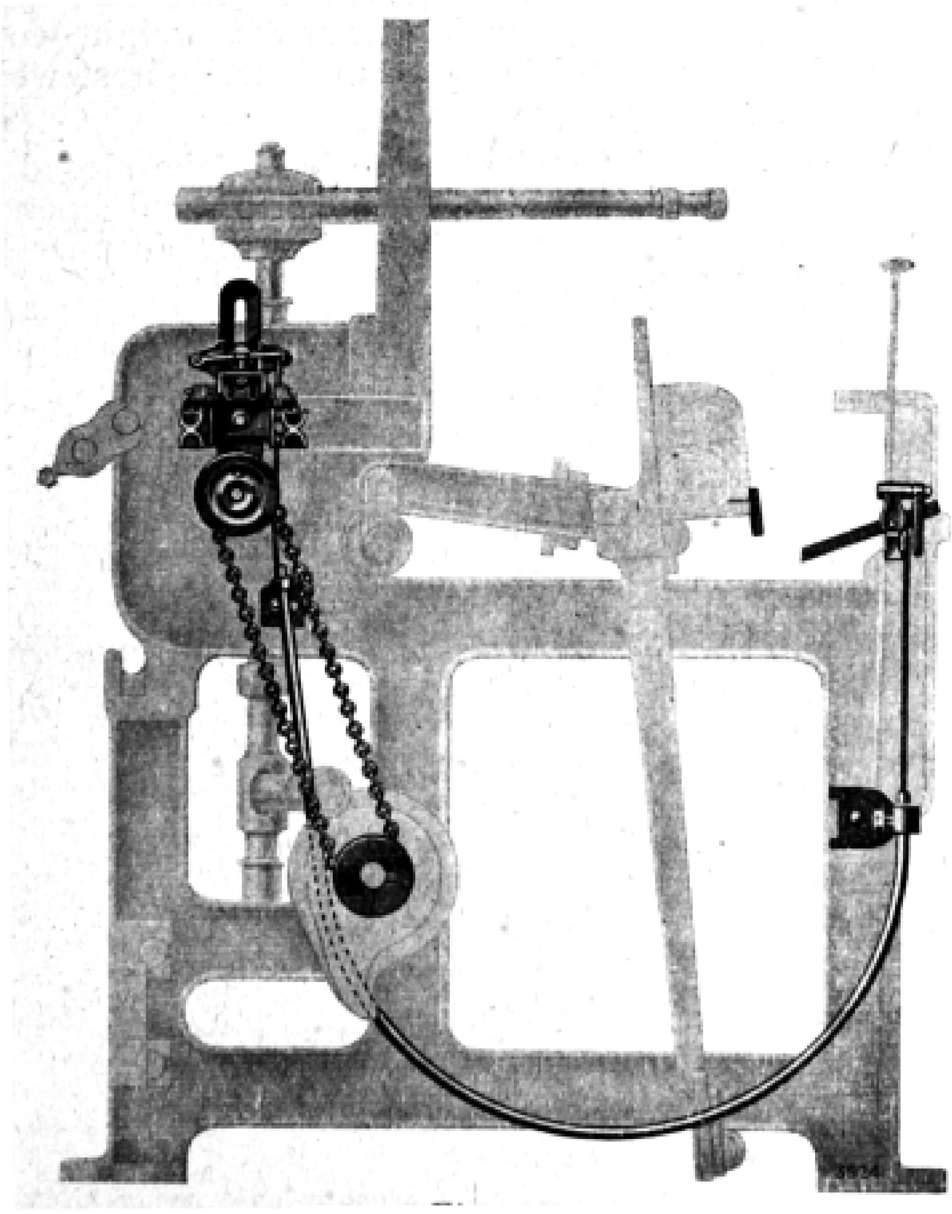

Fig. 467.
Mather and Platt's Mechanical Warp Stop Motion.

Mather and Platt's Warp Stop Motions.

This firm manufacture two types of warp stop motions, one being mechanical, and the other electrical. The former can be driven by either chain, or by belt from the tappet shaft, or from the crank shaft, or electrically driven from tappet shaft only

Fig. 467 shows the chain drive for mechanical action. It consists of a headstock with oscillating mechanism, which actuates a number of notched slide bars that move about $\frac{5}{8}$th inch backwards and forwards. Each moving bar slides in a doubled stationary bar, the upper parts of which are also notched. These bars are fixed above the warp, so that no dust, or fluff, or size can accumulate to hinder the free movement of the sliding bars.

The droppers are made of steel, and are either copper or zinc plated, or unplated and polished. The firm manufacture about 50 varieties which vary in weight to be suitable for the finer or thicker yarns. The lightest weight dropper is ·8 of a gramme.

There are four chief styles, these being the closed and open for mechanical action, and the closed and open for electrical action. When a thread breaks, the dropper falls as shown on the left in Fig. 468.

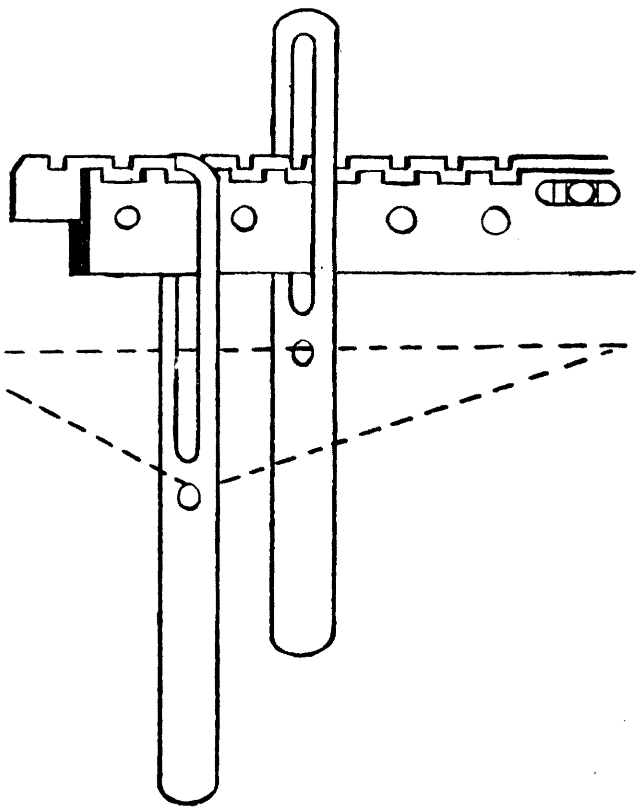

Fig. 468.
Mather and Platt's Mechanical Warp Stop Droppers.

By falling, the dropper is caught between the stationary and moving bars, and arrests the moving notched bars. The arrested movement tightens the cable wire inside the steel tube shown in Fig. 467. The taut wire elevates the finger seen on the setting on handle, which is kept raised for the time being by a small catch. As the going part moves forward, the iron casting shown in black, comes in contact with the raised finger, forces the setting on handle out of its notch, and so stops the loom.

When the warp is "felled out" a fresh one may be twisted to the thrum in the loom without removing heald shafts or droppers, or, if more convenient, then droppers and bars, heald shafts and sley may be conveyed to the twisting frame.

The electric driving for mechanical droppers is given at Fig. 469. The eccentric is timed to begin the push to the

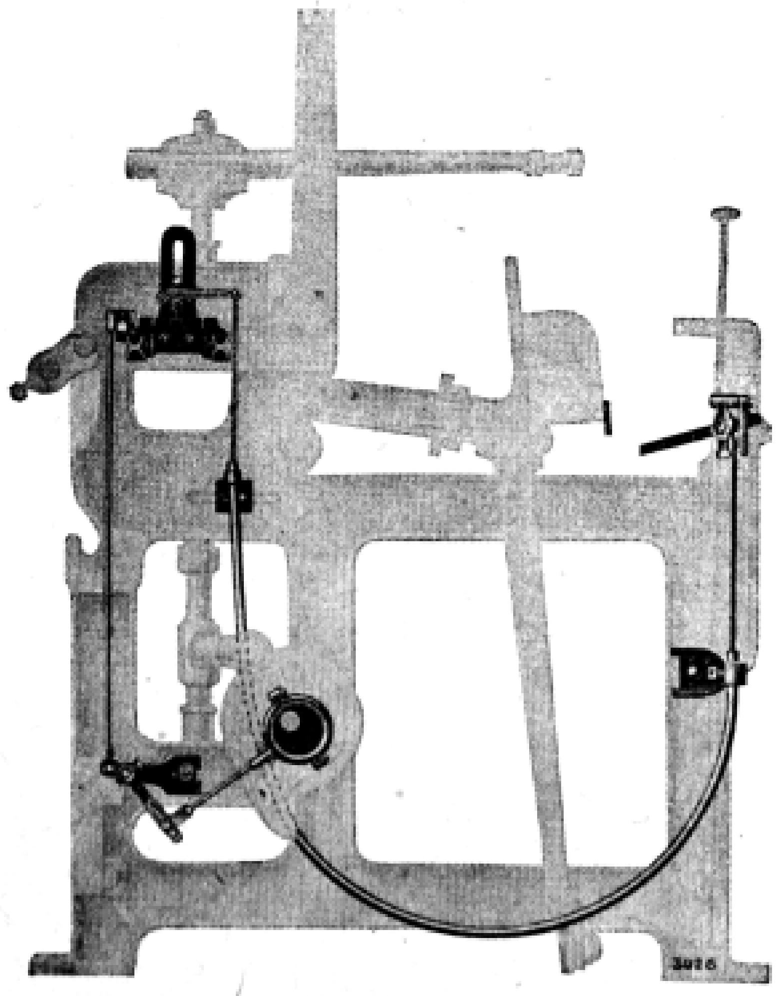

Fig. 469.
Mather and Platt's Electrical Warp Stop Motion.

moving bars when the crank is at or just past its back centre. The leverage imparted to the arm connected by rod to the eccentric must make the bars move at least ⅜th inch.

The electric droppers are presented at Fig. 470. It will be seen that the upper inner part slopes upward. It is astride an electrode, which consists of a body made of steel, and copper plated, and in it is inserted a copper and stationary blade. This blade is insulated from the body by means of a fibre strip. One pole of the battery is connected to the body, and the other pole to the copper blade.

When a dropper falls, the sloping inner top is the means of electrically connecting body and blade. This energises a magnet at the front base of the loom by the

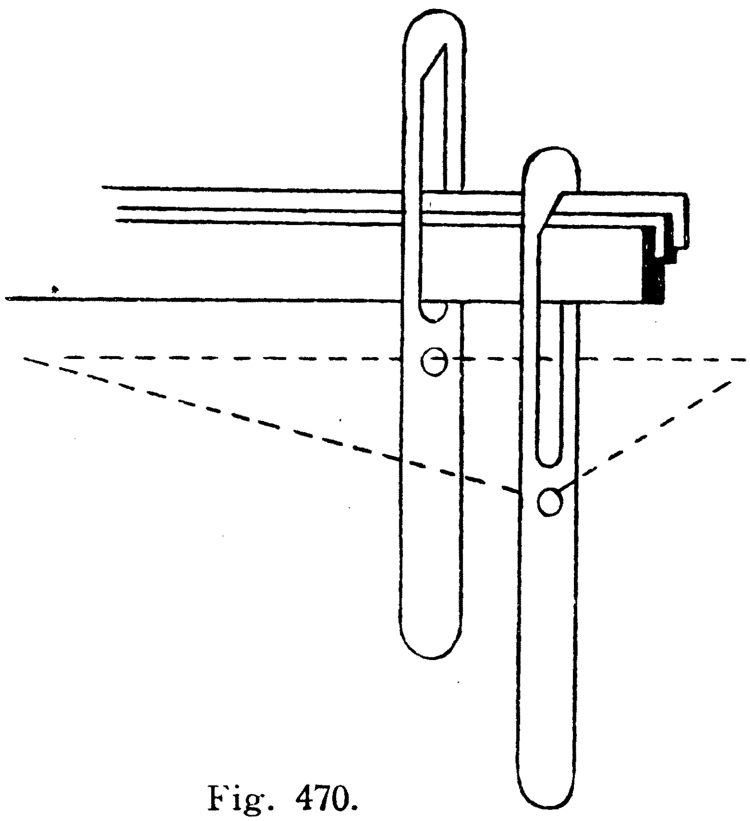

Fig. 470.
Mather and Platt's Electrical Droppers.

setting on handle. The action of the magnet is to raise a finger similar to those shown in Figs. 467 and 468, and the loom is then stopped in the same way. From two to eight electrodes may be fitted to a loom according to the demands of the warp. The current consumption is very small.

Mather and Platt's Humidifier.

For the weaving of most cotton goods, it is essential that there be a humid atmosphere in the weaving shed. Humidity assists in keeping the size on the warps, and makes them more plastic, and the weaving is performed quicker and better. In hard twisted wefts, a dry atmosphere increases the tendency for the weft to snarl, and snarls are difficult to get out of the cloth. Most cotton is made up of fine and small fibres, and by the friction of weaving, many of them are broken off and fly in the air. When the atmosphere is humid, the particles become heavier and drop to the floor more quickly. If humidity has to be maintained within certain limits, it has to be artificially made, and maintained, and tested. The usual standard aimed at is to keep the humidity between 60 and 70 degrees. The amount of humidity is tested by the use of two thermometers, one being for temperature, and the other for moisture. When the records are made from the two bulbs, the nearer they are together, and the more moisture there is in the room, and *vice-versa*.

Messrs. Mather and Platt have made a long and careful study of the whole subject, and after many experiments, have evolved the " Vortex " system of humidification. This is presented at Fig. 471. Briefly, this system consists of a series of cylinders connected together that are served by a pump which delivers drinking water at a pressure of 135 lbs.

Fig. 471.
Mather & Platt's Humidifier.

per square inch. In the upper interior of the cylinder is a nozzle, the latest pattern being made of gun metal. Through this, 960 lbs. of water is pumped per hour at the pressure stated, the jet of the nozzle only being $\frac{1}{16}$th inch. Below the nozzle is the flat head of an adjustable pin which is also made of rustless steel. As the water is forced down upon it, the spray is thrown down the whole width of the tank. This method sucks in the air at about 500 cubic feet, per minute, and the only escape the air can make is through the spray of water. It is in this way that the air of the weaving shed is humidified, cooled or heated by the use of cold or hot water, and the particles of dust and fibre removed.

SHUTTLES FOR LANCASHIRE LOOMS.

The management of shuttles has previously been explained in " Chapter on Shuttles," but new and improved shuttles are made by various firms, and some of these are illustrated herewith and explained.

The Pilkington Shuttle.—Two views given, and is for weaving rayon. It is 15 inches long, $1\frac{9}{16}$ inches wide, $1\frac{1}{8}$ inches deep. Length of pirn spindle $6\frac{5}{8}$, and has a paper pirn with a metallic flanged bottom, held by steel clips by spindle block, the pirn being $5\frac{1}{2}$ inches long. The shuttle is not as deep as the general run, and will work with a less shed. In selecting a pair of shuttles, they must be as near the same size, weight and grain as possible.

Swivel.—The swivel is at D, Fig. 472. It is made of nickel-plated wire, and solder fills up the spaces, and there

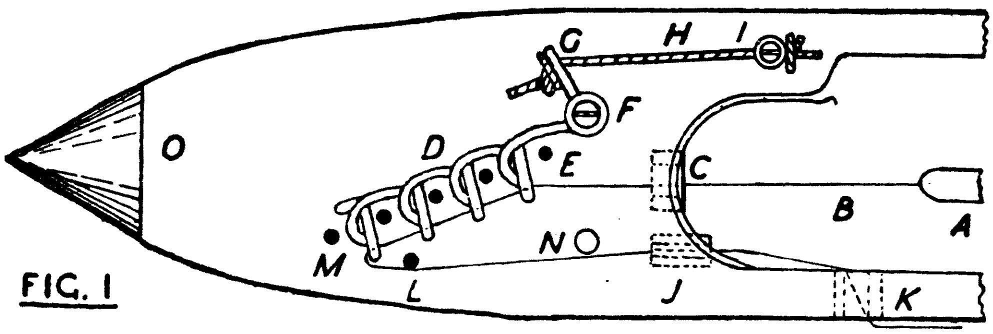

Fig. 472.
Pilkington's Rayon Shuttle (Top View).

is no thread catching when the weft is slack. There are four loops for weft to pass through, and at F, is twisted like a coiled spring, is rotary, and held by a screw that passes through top of shuttle. The bottom ends in an extended loop, and through the loop, thick elastic H, is passed and knotted.

At I is a screw bored through, and takes the other end of the elastic. The screw is turned by a screw driver to tighten the elastic, and holds the swivel more rigidly.

Weft Threading.—To thread the weft the looped end G is pressed forward as in Fig. 472, this pressure taking the loops on the swivel past the vertical steel pins in an oblique row at E. The threading hook then goes through all four

loops, and also the shuttle eye at C, and in this way weft B is conveyed through its forward traverse. The backward part is effected by passing the hook from right to left through the eye, and extending it below pins L and M. The final threading is through eye K at shuttle front.

The shuttle may be threaded in four ways.

(1). As arranged in Fig. 472 by leaving out pin M.

(2) To use all the loops and pins at Fig. 473.

(3) If a very light tension is required, then the weft may be brought down from third pin on right and passed behind pin L.

(4) In case the weft is cut or soiled in the box, instead of being passed through shuttle eyes at J and K, it is threaded through eye N in shuttle top, and passes to the cavity below. The weft then passes over the shuttle top, and does not come in contact with the inner side of box.

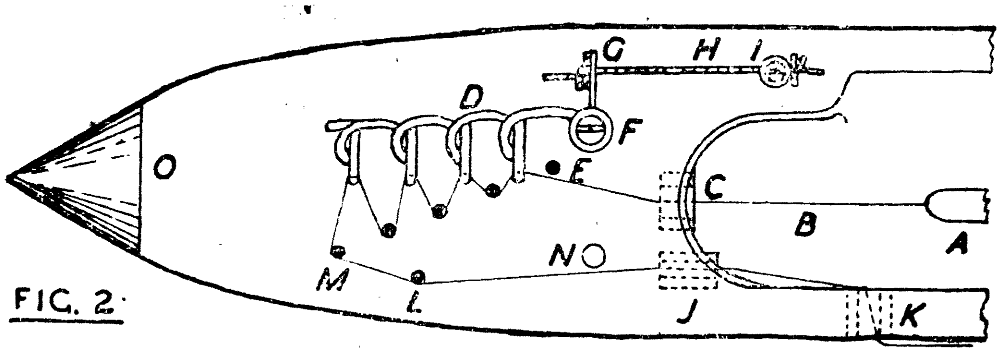

FIG. 2.

Fig. 473.
Pilkington's Rayon Shuttle Thread.

Swivel in Weaving Position.—As soon as the weaver releases loop G, elastic H immediately pulls the swivel back to the position at Fig. 473. The weft now makes a zig-zag path through the swivel loops by means of the row of pins E. If the elastic loses power it is easily replaced by taking out screws F and I that liberates swivel and elastic.

If elastic is cut into standard lengths, it can be knotted to satisfaction first time. The inner sides of the shuttles are shaped to the length of the pirn to receive strips of suitable fur. It will be realised that a swivel shuttle is superior to those using mops for rayon weaving, for the swivel is resilient to the amount of drag on the weft. If the spindle has dropped, the swivel eases the drag.

Hand Threading Rayon Shuttle.—The shuttle here demonstrated has been patented by Messrs. James Nelson, Ltd., Valley Mills, Nelson. Its total length is 15⅛ inches to provide room for long pirns, and promotes production.

Front depth $1\frac{17}{32}$ inches; back depth $1\frac{5}{16}$ inches, and conforms more to the shape of the front shed than most shuttles. It enables it to enter and emerge with more than ordinary ease, or allows a less shed to be made, Fig. 474. The spindle has a curved spring on its upper surface to hold the pirn. There are also two semi-circular wires between which the metal head of the pirn is made to pass.

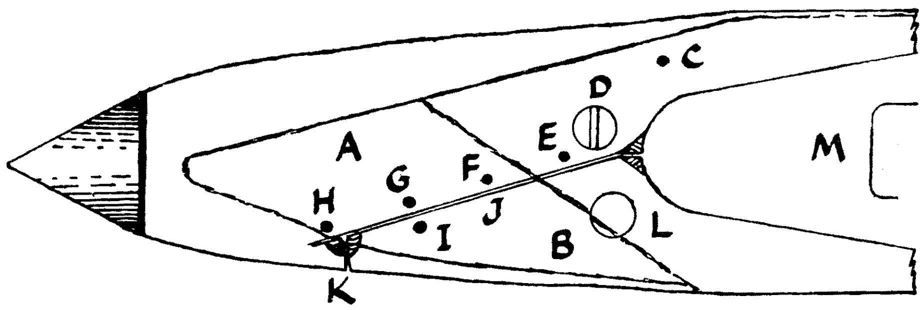

Fig. 474.
Messrs. Nelson's Silk and Rayon Shuttle. (Top View).

The under side of spindle block is **V**-shaped, and rests on a sloping part of the shuttle bottom, and the shaped part of a hard wooden peg. The spindle is kept in its weaving position by the pressure of an open spiral spring at the back of the spindle block. The block is held by a wooden peg. Should this work out at the back it would not do as much damage as a metal peg.

The total length of pirn is $6\frac{3}{4}$ inches and weft length $6\frac{1}{4}$ inches.

Top View.—This is at Fig. 474. The spaces A and B are cut away for reasons already explained. This cutting away is a little against the balance of the shuttle, for if the tip ends be swung between thumb nails, it tilts backward to an angle of 30 degrees. Instead of this being against good running, it is really more favourable, for it leans more heavily against the reed, and conforms more to its motion The angle formed by the shuttle race and reed must exactly conform to the angle made by shuttle back and bottom. C is the pin holding one end of the elastic connected to weft trap, and D the screw that forms the trap pivot. The steel pins, E, F and G, brake the weft before it emerges from shuttle. Pin H is for the weft to run against when flight of shuttle is to the right, and pin I does the same for the left run. Cut J is for the hand threading of the weft, and its length is $1\frac{6}{10}$ inches. From this, a short cut is made at K that leads weft outside shuttle. At L is strong wooden peg that gives support to severed part of shuttle front. The end of pirn is at M, and the distance from end to entrance of tunnel is $1\frac{1}{2}$ inches, and gives freedom for weft to unwind.

Both inner sides of shuttle are lined with opossum fur for the full length of the weft section on the pirn.

Shuttle Threading.—It is outlined at Fig. 475. The shuttle is held in right hand, and the index finger pressed against weft trap at M. Elastic N is stretched, and trap pushed towards shuttle as shown. The two loops in the trap allow it to pass beyond pins E and F. At I, J and K, the wire is brought upward and forward, and then goes downward, inward, and a little upward. The forward part covers half the distance of the long loops, and is shaped Grecian pattern. The left hand holds weft B, and in going through cut J in Fig. 474, it enters the short tunnel C in Fig. 475. The weft then passes down the front sections I, J and K, and then emerges from shuttle at P.

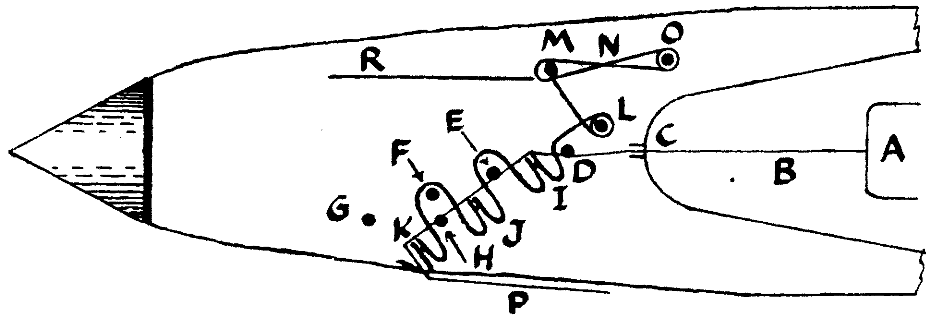

Fig. 475.
Messrs. Nelson's Non-Kiss Shuttle Threaded.

The weft is not properly threaded until the finger frees the trap at M. Then the backward movement of the trap forces the weft underneath the bent ends of the trap, and the results are seen in Fig. 476.

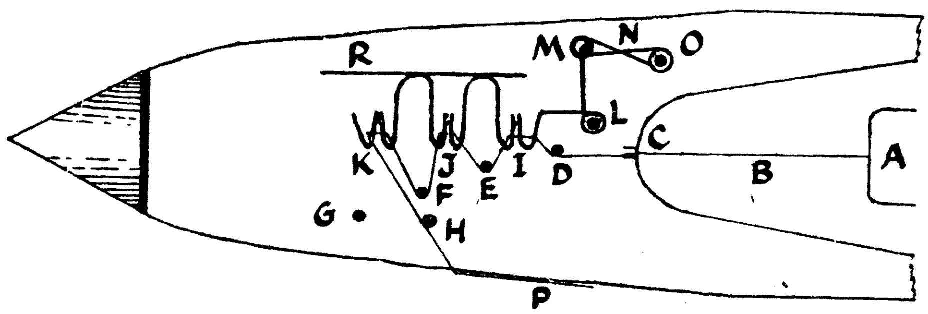

Fig. 476.
Messrs. Nelson' Shuttle Trap Pressed for Threading.

Weft in Weaving Position.—The weft trap comes to rest by the looped ends contacting with cut out part R. The weft now zig-zags between the pins and the trap. It is smallest at D and I, larger at E and J, and largest at E and K. The weft runs against pin G on one traverse and against pin H the next.

No hook is required to thread the shuttle, and no brushes or mops are necessary.

A Non-Kiss Shuttle.—The length of the trap is $1\frac{1}{10}$ inches; width, $\frac{4}{10}$ inch; depth $\frac{5}{20}$ inch. The length of front slot in shuttle where the weft emerges is $1\frac{1}{4}$ inches. The length of the back slot is $1\frac{1}{16}$ inches.

The shuttle has not to be nipped too tightly in the left hand box, so that no injury is done to the cut section of the shuttle.

Where the trap operates, the shuttle is cut through from front to back, but does not interfere with the holding of the shaft of shuttle tip.

A fibre washer is placed between the wood of the shuttle and the inner circle of the shuttle tip. The shuttle is well made, is quickly threaded, and promotes production.

COTTON DESIGNS.

Quite a number of designs are used for cotton goods that are seldom used for other textiles. Some are included in this selection that are extensively used in almost all classes of goods. The same weave with different yarns or finish of cloth is given another name, and there are also local names.

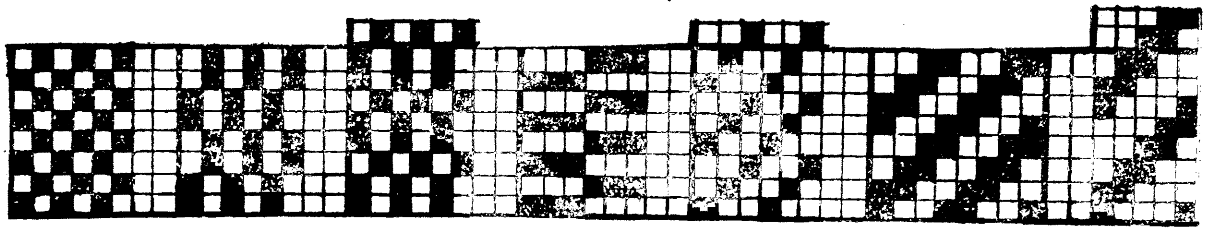

Fig. 477. Fig. 478. Fig. 479. Fig. 480. Fig. 481. Fig. 482. Fig. 483.

Fig. 477. Plain weave. Calico. Tabby. Repp. Sicilian.

Fig. 478. Ordinary warp rib. Poplin.

Fig. 479. Variation of warp rib with unequal ridges weft way.

Fig. 480. Weft rib. Moreen.

Fig. 481. Three shaft weft twill. Cashmere. Jean. Genoa.

Fig. 482. Two and two twill. Shalloon. Harvard. Serge. Sheeting.

Fig. 483. Five end weft twill.

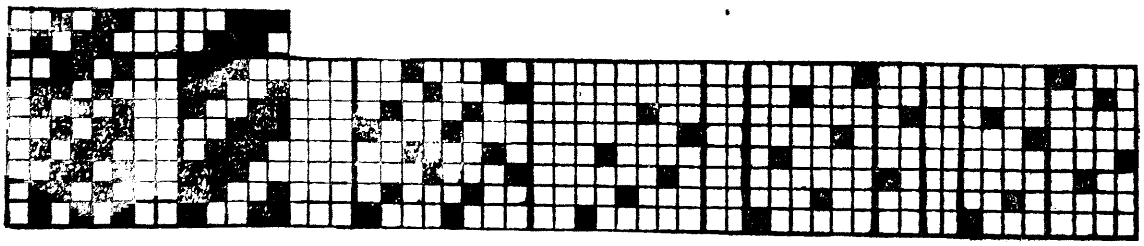

Fig. 484. Fig. 485. Fig. 486. Fig. 487. Fig. 488. Fig. 489.

Fig. 484. Five end contrast twill.

Fig. 485. Venetian.

Fig. 486. Four end sateen (weft). Broken Swansdown.

Fig. 487. Six end sateen (weft).

Fig. 488. Eight end weft sateen.

Fig. 489. Broken 8-shaft weft sateen.

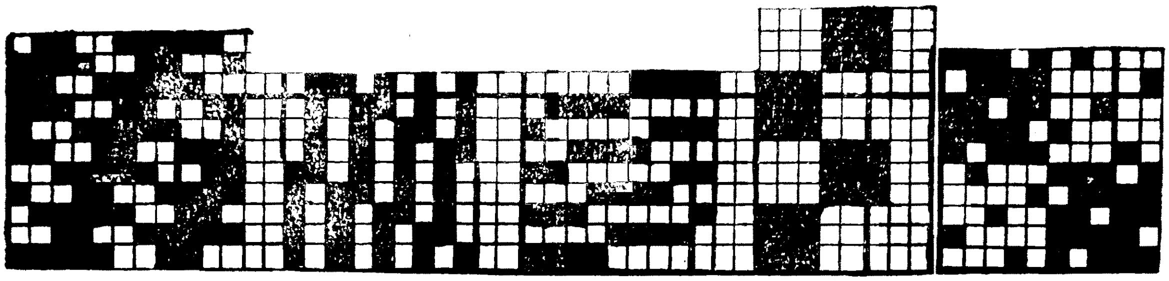

Fig. 490. Fig. 491. Fig. 492. Fig. 493. Fig. 494.

Fig. 490. Stepped twill. Gabardine.
Fig. 491. Nine shaft warp corkscrew.
Fig. 492. Nine shaft weft corkscrew.
Fig. 493. Hopsack. Matt. Basket. Dice.
Fig. 494. Five shaft warp and weft sateen check.

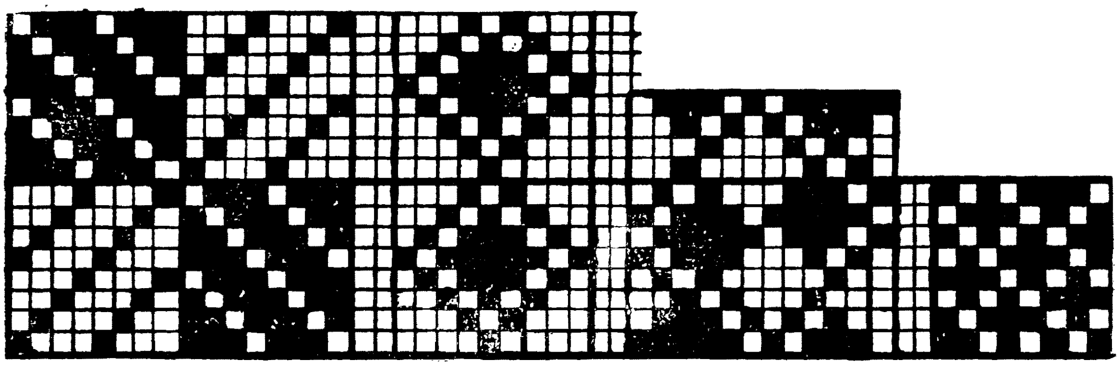

Fig. 495. Fig. 496. Fig. 497. Fig. 498.

Fig. 495. Dice twill counterchange.
Fig. 496. Honeycomb.
Fig. 497. Brighton honeycomb.
Fig. 498. Crépe.

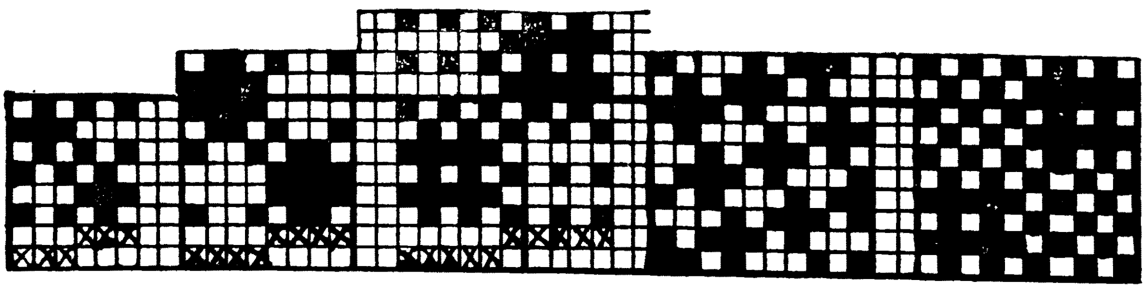

Fig. 499. Fig. 500. Fig. 501. Fig. 502. Fig. 503.

Fig. 499. Mock Leno. Three threads in dent.
Fig. 500. Mock Leno. Four threads in dent.
Fig. 501. Mock Leno. Five threads in dent.
Fig. 502. Sponge cloth.
Fig. 503. Huckaback.

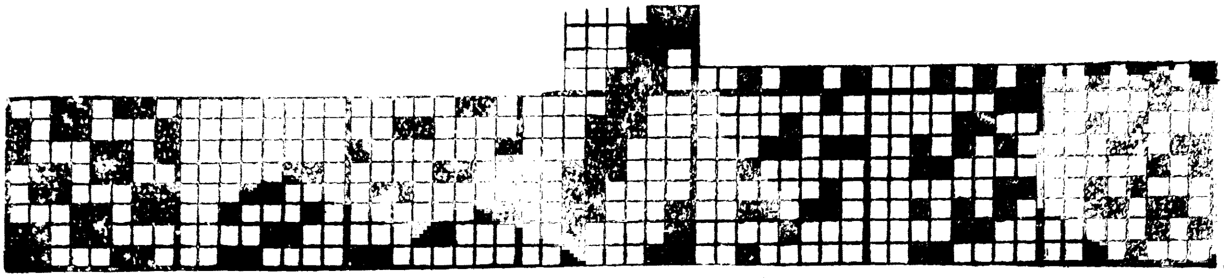

Fig. 504. Fig. 505. Fig. 506. Fig. 507. Fig. 508. Fig. 509. Fig. 510.

Fig. 504. Twilled hopsack. Granite.
Fig. 505. Swansdown.
Fig. 506. Imperial.
Fig. 507. Diagonal. Cantoon.
Fig. 508. Moleskin.
Fig. 509. Bevereen.
Fig. 510. Corduroy.

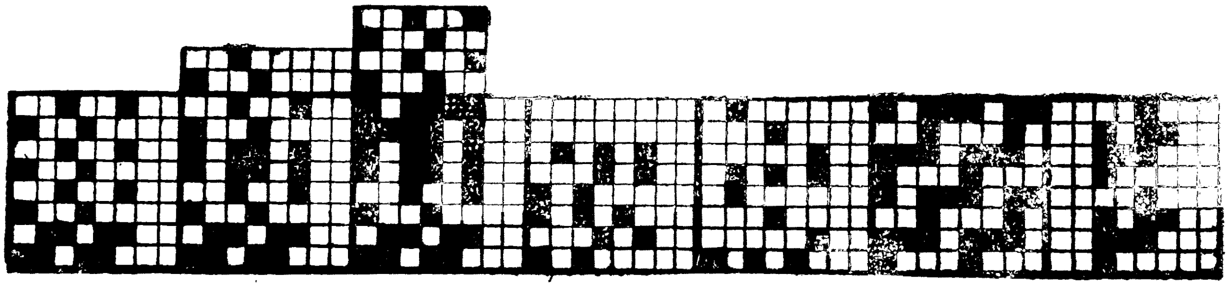

Fig. 511. Fig. 512. Fig. 513. Fig. 514. Fig. 515. Fig. 516. Fig. 517.

Fig. 511. Pique.
Fig. 512. Pique with wadding picks.
Fig. 513. Pique with wadding and backing picks.
Fig. 514. Corduroy with plain back.

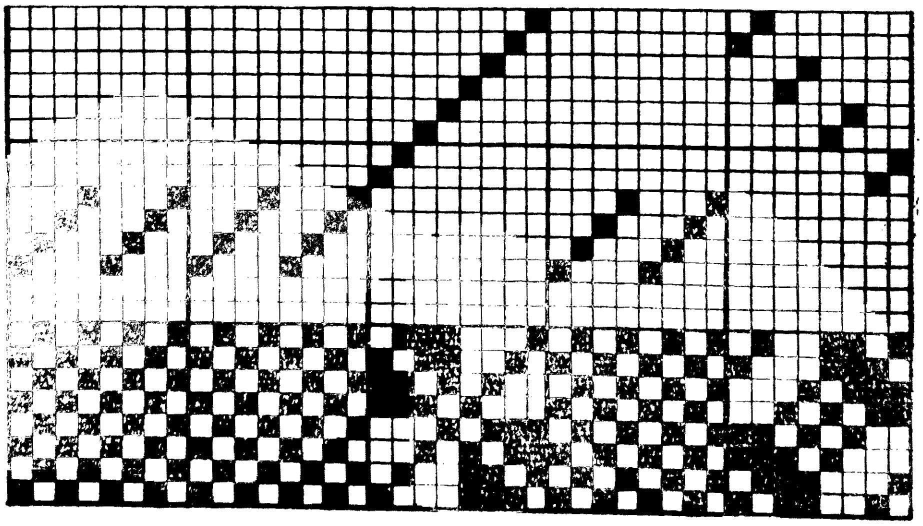

Fig. 518.
Oxford Shirting Drafted on 12 Shafts.

Fig. 515. Velveteen with plain back.
Fig. 516. Double plain weave.
Fig. 517. Two separate cloths.

Fig. 518. *Oxford Shirting.*—These are distinguished by having plain stripes and figured ones. The plain ends are sometimes doubled which then gives the cloth the effect of a weft cord ground. All kinds of small figures are used but those are neatest that fit with the ground weave.

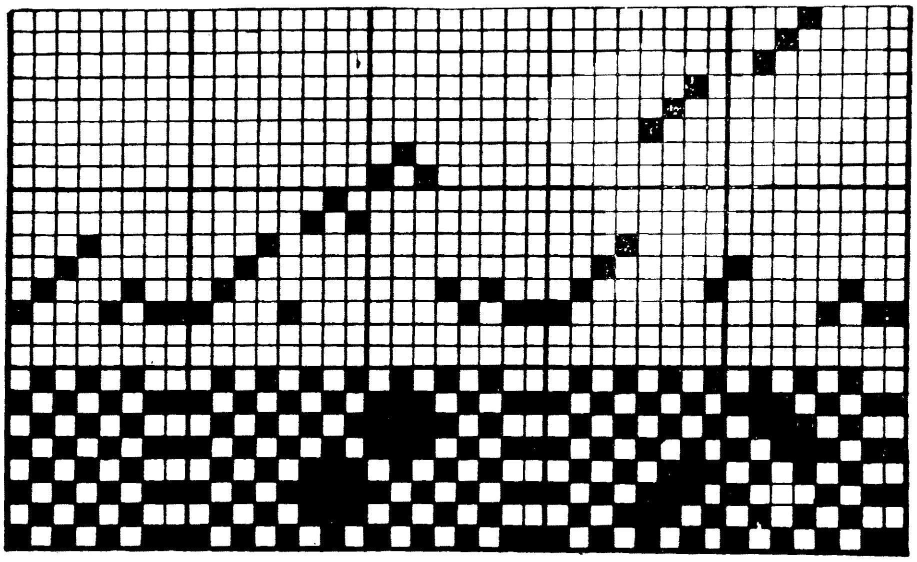

Fig. 519.
Zephyr Shirting Drafted on 14 shafts.

Fig. 519. *Zephyr Shirting.*—These cloths have also a plain ground and figures in stripe formation, but there are also weft cord stripes, which gives more variety than the previous example. Small neat figures are to be preferred to those with long floats.

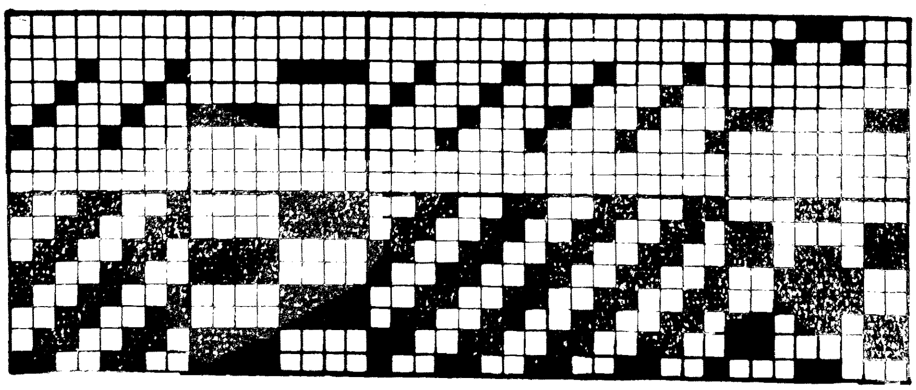

Fig. 520.
Harvard Shirting Drafted on 6 shafts.

Fig. 520. *Harvard Shirting.*—The ground weave is 2 and 2 twill, and the figures in the stripes are usually bolder. When they cut with the ground weave, neatness is added to variety.

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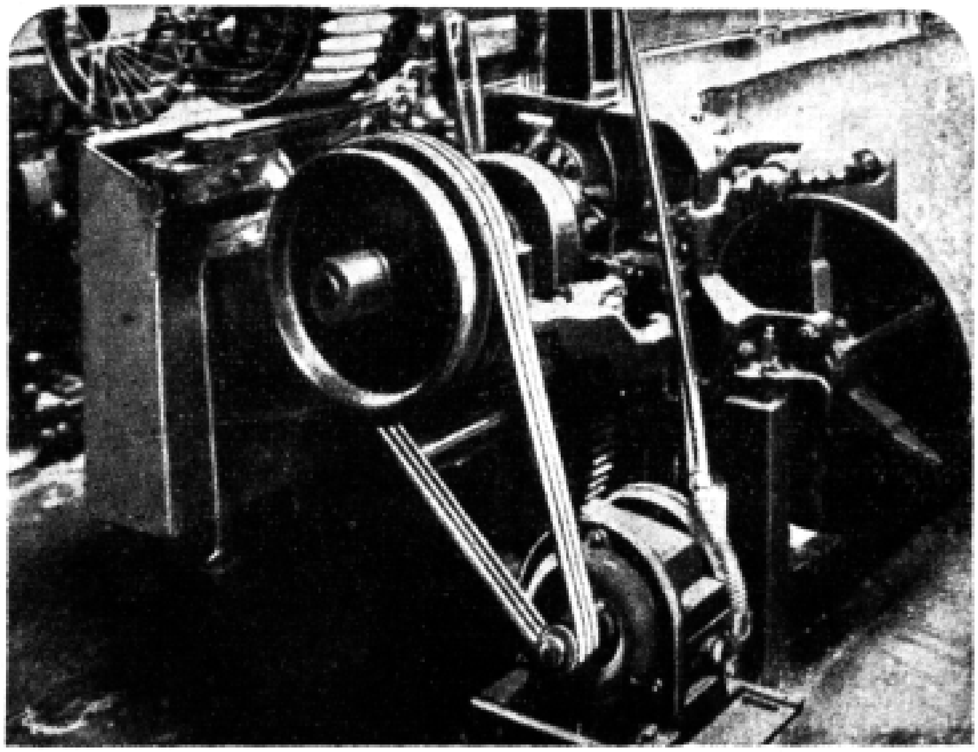

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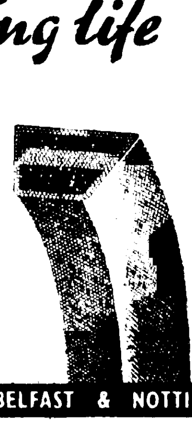

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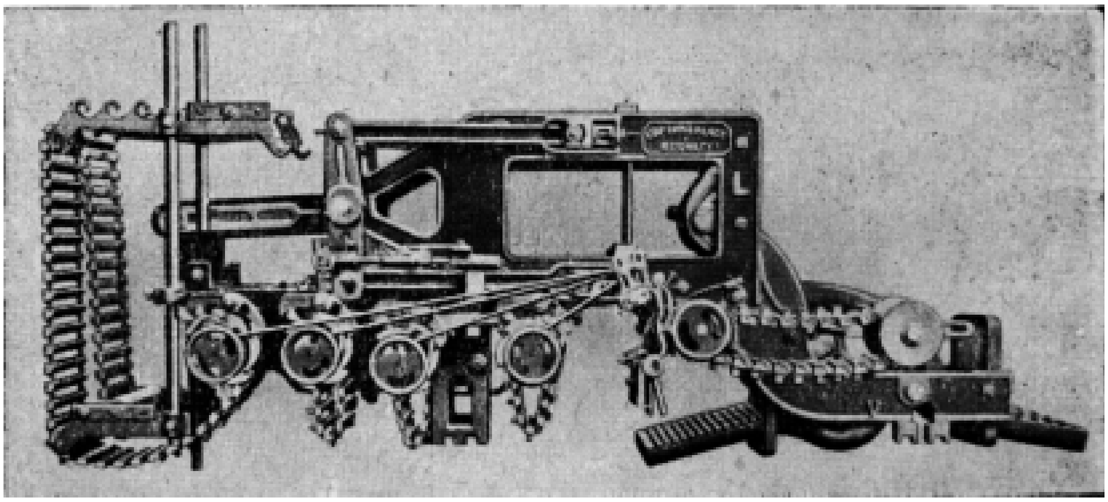

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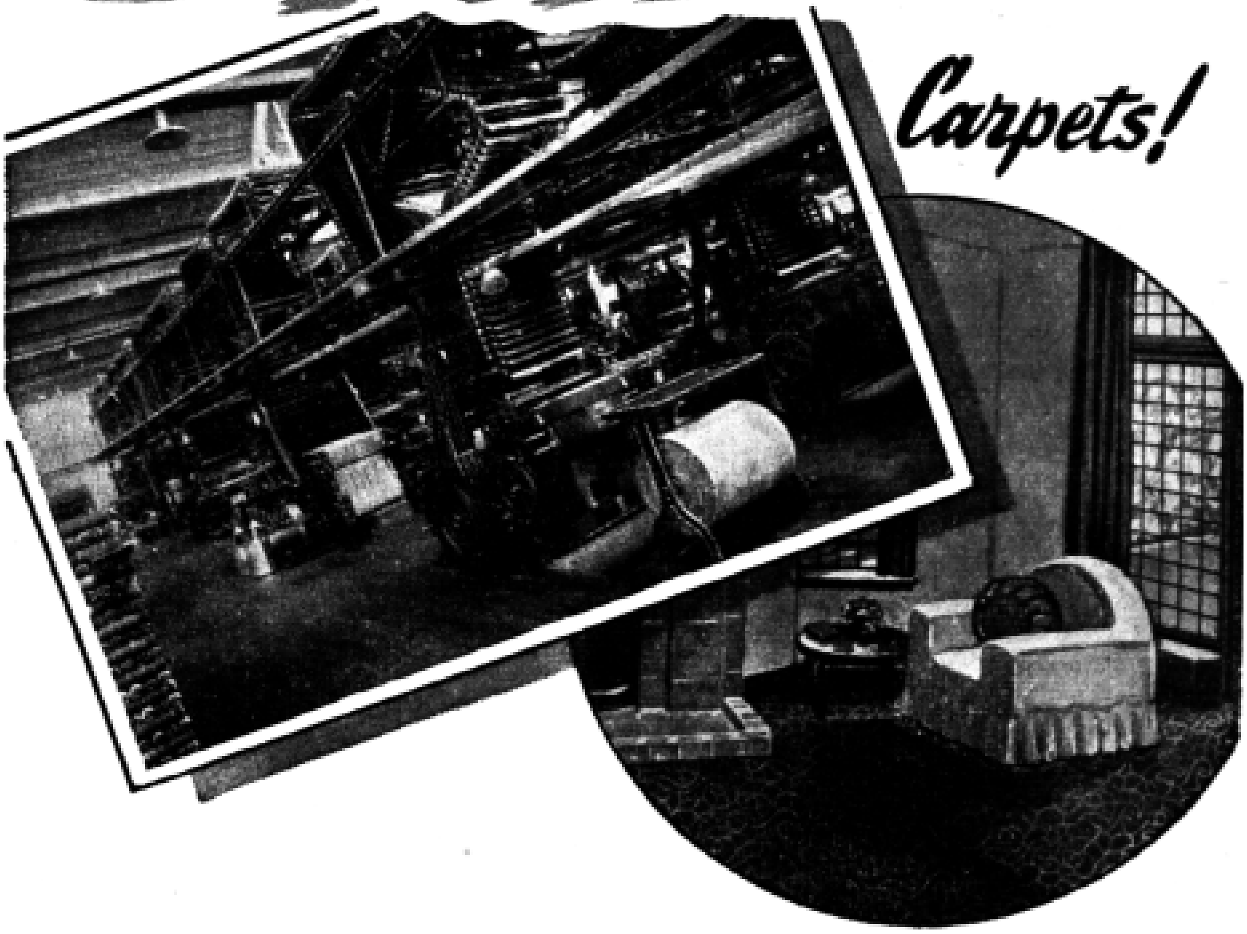
★ towards the house of TO-MORROW



THE illustration is of an installation of a three-quarter (27 inch) Platt's Axminster Carpet Looms of the double needle, single insertion, split shot type, the effective production of which greatly exceeds that of older models working on the double insertion principle.

TABLE OF LOOM SIZES AND RECOMMENDED WORKING SPEEDS

Reed Space	*Speed*
18 inches	30 rows of tufts per minute
22½ inches	29 rows of tufts per minute
27 inches	28 rows of tufts per minute
32 inches	27 rows of tufts per minute
36 inches	26 rows of tufts per minute
45 inches	25 rows of tufts per minute
48 inches	24 rows of tufts per minute
54 inches	23 rows of tufts per minute
90 inches	17 rows of tufts per minute
108 inches	16 rows of tufts per minute

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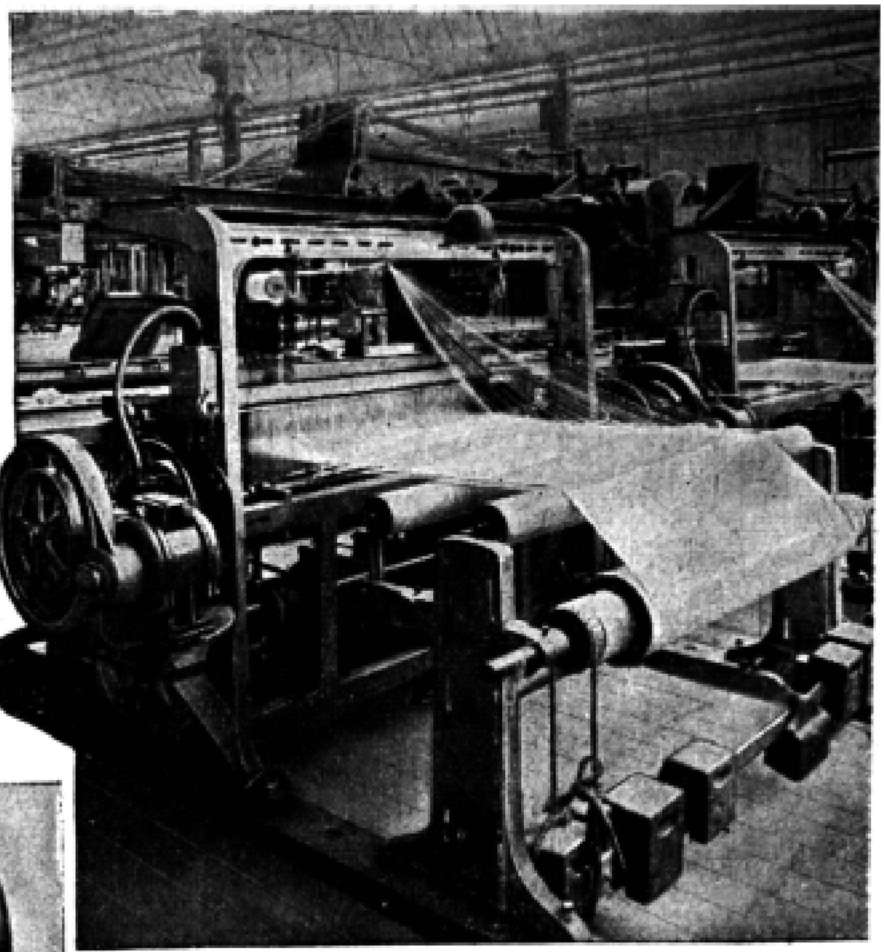
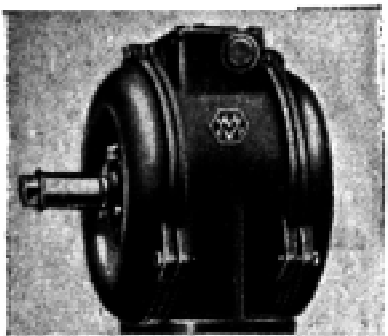
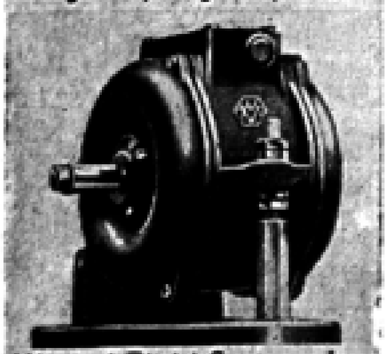
Illustration shows 1 H.P. *motor driving Rüti Silk Loom through gearing.*





Foot-mounted

Hinged Spring Suspension



Hinged Rigid Suspension

A typical Metrovick drive

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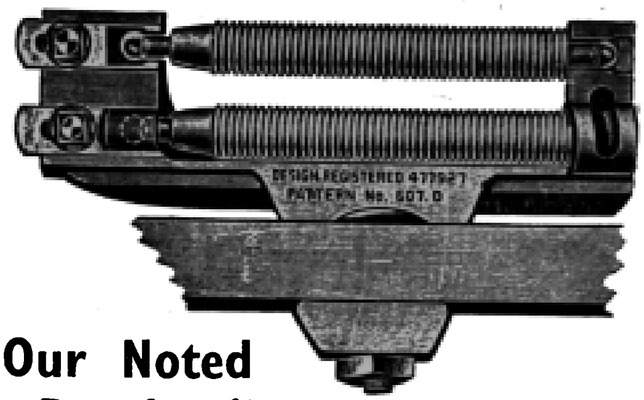
TEMPLES
for Modern Looms

No. 23.

15 Ring Temple



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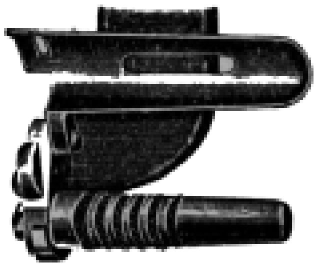
for Woollen Cloths



1059

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