WHITIN MACHINE WORKS
1917

1917

ILLUSTRATED AND DESCRIPTIVE CATALOG

OF

WHITIN TEXTILE MACHINERY

AND

HAND BOOK OF USEFUL INFORMATION

FOR MANUFACTURERS AND ENGINEERS

WHITIN MACHINE WORKS,

WHITINSVILLE, MASS., U. S. A.

Press of C. A. Hack & Son, Inc.
Taunton, Massachusetts
1917

INTRODUCTORY

IN compiling this new edition of our general catalog it has been our aim to present the subject matter in as concise a manner as possible. Abbreviated descriptions are given of the various textile machines which we manufacture, but more complete descriptions can be obtained by referring to the sectional catalogs which we issue; also to circulars descriptive of same, which we will be glad to forward on application. The production tables, floor spaces, plans of machines and other data, we trust will be found useful to Manufacturers and Engineers in the organizing and planning of textile manufacturing plants with which they may be connected.

It may be of interest to add that the manufacture of textile machinery was commenced in Whitinsville in 1831, and the growth of the Whitin Machine Works has been steady and continuous since that time. Today the plant, exclusive of tenements, sheds, etc., comprises nearly 30 acres of working floor space, and, at full capacity, furnishes employment for approximately 3500 people. It builds a complete line of cotton mill machinery, beginning with picking and ending with weaving. Aside from the usual line of cotton mill machinery it is in a position to furnish machinery for the manufacture of wool, asbestos, flax and other textile fibres.

It has been particularly the aim of its management from the beginning to furnish the best and most carefully built machinery it is possible to produce. To this end no expense has been spared in the arrangement of buildings, machinery organization, and tool equipment, to a degree, perhaps, not equalled by any other manufacturing plant in the world.

WHITIN MACHINE WORKS.

WHITINSVILLE, MASS., U. S. A., Mar. 1, 1917.

GENERAL
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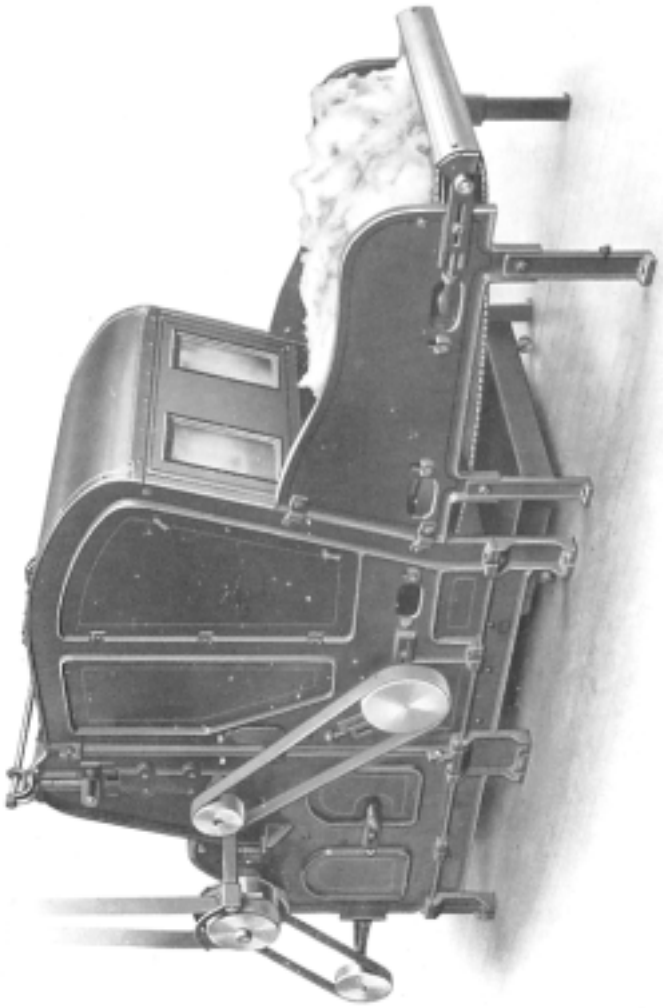
OPENING AND MIXING



Bale Breaker

BALE BREAKER

This Machine is designed for the purpose of opening the stock from the bale. Where any great amount of stock is to be handled, the machine can be placed in the warehouse, and as the stock passes through the machine, it can be distributed or exhausted to the bins in the cleaning and mixing department.

The Production of this machine is from 15,000 to 20,000 lbs. in 10 hours, and it delivers the stock to the next process opened in the best possible condition.

Speed of main shaft 450 r. p. m. Size of pulleys 12″ x 2½″.

Horse Power consumption is from 4 to 5 horse power.

Belting Required:

Pin apron belt 9′, 3″ of 3″ belting.

Feed and Delivery apron belt 17′, 0″ of 2½″ belting.

Extras:

Fans and Exhauster system.

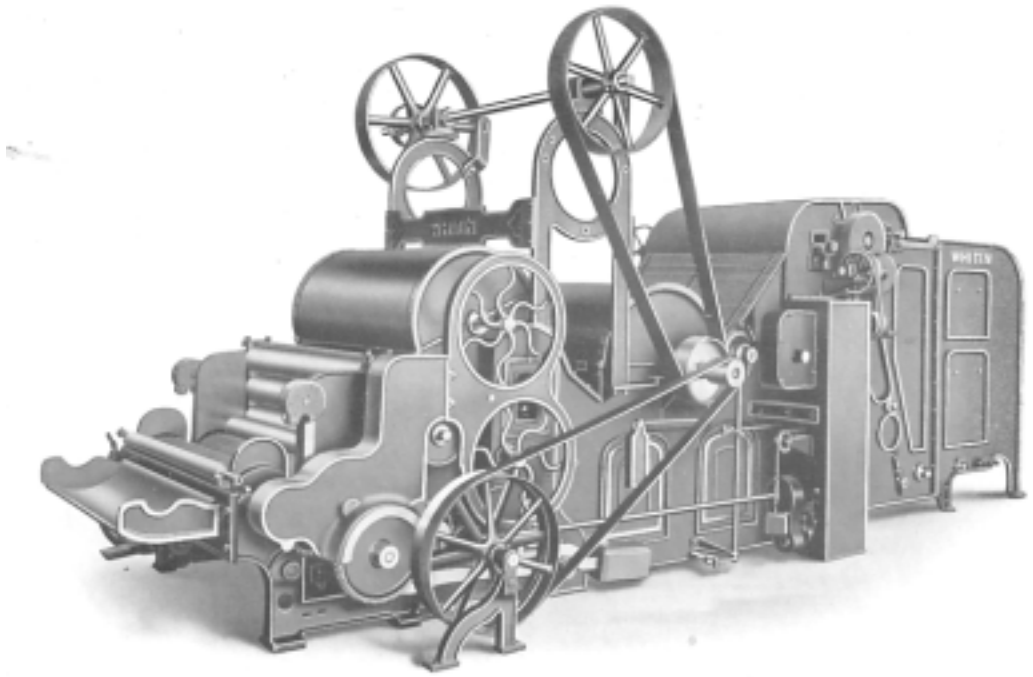
Traveling aprons and Conveyer system.

Floor Space: 13′, 8″ x 5′, 10½″.

Weights:

Net Weight 4300 pounds.

Shipping Weight 4600 pounds.



Breaker Lapper, with Automatic Feed and Evener

BREAKER LAPPER

This Machine is designed for the purpose of cleaning the raw stock and converting it into a lap. As illustrated it is shown equipped with an Automatic Feed, Evener Motion and one Beater. Preferably we recommend it to be built with two Beaters—the first of the Buckley Type—the second a Carding Beater.

The Production with one beater is 1800 pounds to 3200 pounds per day of 10 hours; with two beaters 2500 pounds to 4000 pounds.

The Horse Power consumed is from 4 to 8 horse power, according to the number of beaters.

Speed of driving shaft 435 r. p. m. Size of pulleys 16″ x 4¼″.

Belting Required:

Fan belt 7′, 11″ of 2½″ belting.
Beater belt 17′, 5″ of 4″ belting.
Calender roll driving belt 12′, 7″ of 2½″ belting.
Cone belt 6′, 9″ of 1″ belting.
Doffer belt 10′, 11″ of 2½″ belting.
Pin apron belt 5′, 10″ of 2½″ belting.

Extras Required:

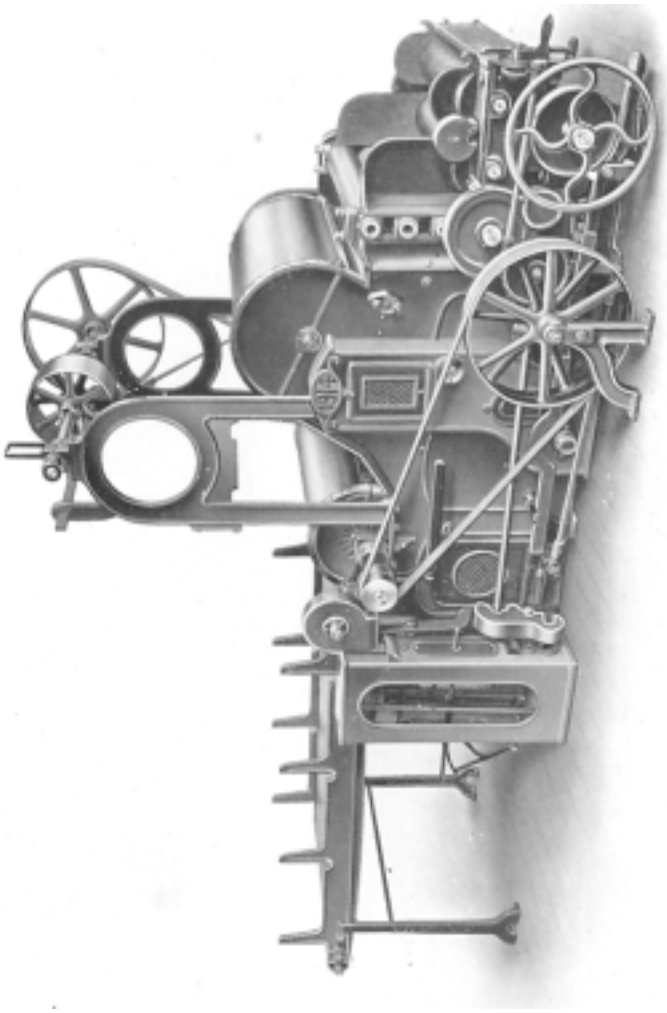
Lap Rods.
Automatic Feed.
Extra Beater Section.
Buckley Opener Section.
Steel Trunk Section.
Split Lap Preventers.
Adjustable Grid Bars.

Floor Space:

One Beater Machine 16′, 0″ long by 6′, 8″ wide.
Two Beater Machine 22′, 0″ long by 6′, 8″ wide.

Weights: One Beater Machine

Net Weight 8000 pounds.
Shipping Weight 8500 pounds.



Finisher or Intermediate Lapper

FINISHER LAPPER

This Machine is used for second and third processes in picking, where, on the better classes of yarn, it is necessary to clean the stock a little better. The machine is equipped with an arrangement for doubling four laps at the back, and also an evener motion. It is used to form laps for the cards, using the breaker picker laps on the back when used as an Intermediate and Intermediate laps when used as a Finisher.

The Production is 1500 to 3000 pounds per day of 10 hours.

Horse Power consumed about 4.

Speed of driving shaft 435 r. p. m. Size of pulleys 16″ x 4¼″.

Belting Required:

Cone belt 6′, 9″ of 1″ belting.
Beater belt 14′, 8″ of 4″ belting.
Calender roll driving belt 12′, 7″ of 2½″ belting.
Fan belt 7′, 11″ of 2½″ belting.

Extras:

Adjustable Grid Bars.
Lap Rods.

Floor Space: 16′, 0″ x 6′, 8″.

Weights:

Net Weight 6000 pounds.
Shipping Weight 6200 pounds.

SPECIFICATION FOR PICKING MACHINERY

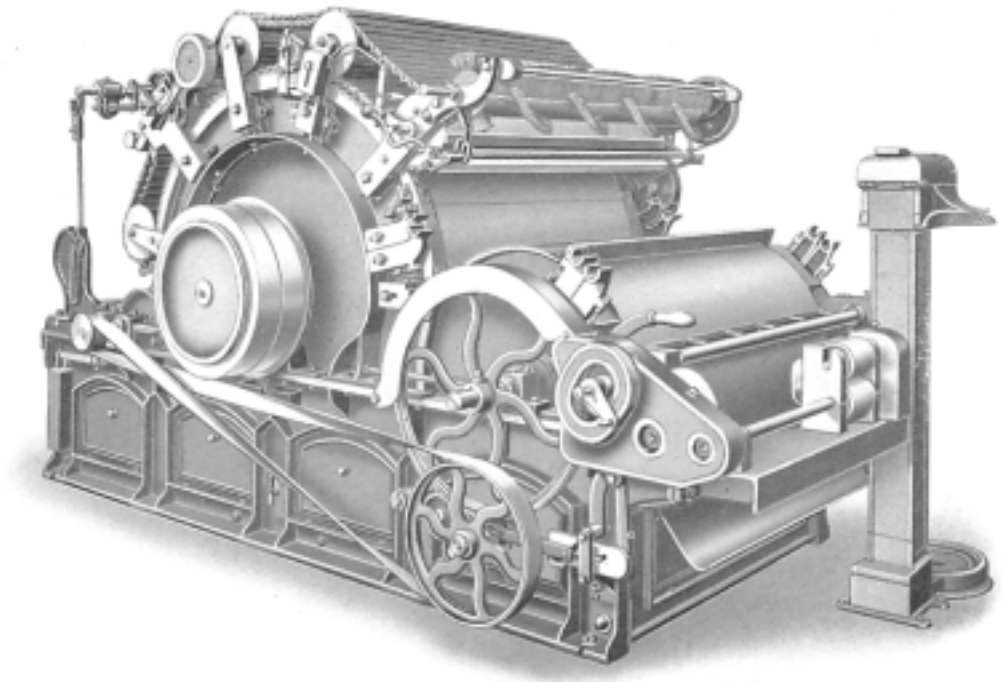
How Many Machines?
What Machine?
Inside width of Machines?
To what are Automatic Feeders to be connected?
Length and Width of Conducting Trunk?
Length and Diameter of Conducting Pipe?
Width of Lap?
Weight of Lap per yard at back?
Weight of Lap per yard to be made?
Number of Beaters?
Style of Beaters?
Diameter of Beaters?
Revolutions per minute of Beaters?
Revolutions per minute of Main Shaft?
Are Machines to be Motor Drive, or Belt Drive?
If Belt Drive, Driving Pulleys are 16″ x 5″.
Is Evener Motion wanted?
Production per day of 10 hours?
Length of Cotton to be used?

NOTE.—The different machines are Willows, Bale Openers, Automatic Feeders, Openers, Breaker Lappers, Intermediate Lappers, Finisher Lappers, Waste Openers.

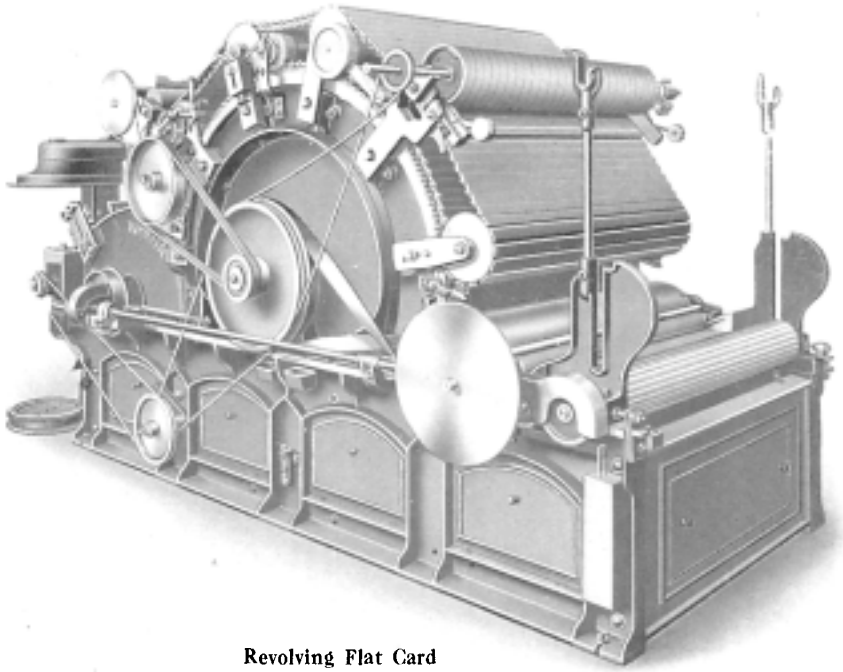
2-Blade Rigid Beaters will be furnished unless otherwise specified.

Machines will be painted BLACK unless otherwise specified.

CARDING



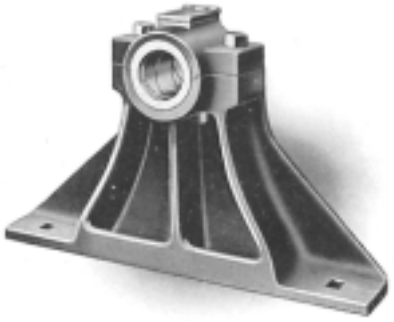
Revolving Flat Card



Revolving Flat Card

THE WHITIN REVOLVING FLAT CARD

The Whitin Revolving Flat Card is the result of many years' experience. Its development and present perfection is due not only to the well balanced and capable organization behind it, but as well to the suggestions of its many friends in the various mills in the country. A great many thousands of these cards are working today on every class of work to be found in cotton mills. Every refinement of construction which tends for longer wear, better work and less attention from the operative has been carefully worked out. The settings are easy to make, accurate, positive in their adjustments, and the card is built so as to retain these settings under all conditions. We describe briefly in the following pages many of the admirable and distinctive features which have given the Whitin card its popularity and enviable reputation. While we call attention to these features, yet we would desire to emphasize the fact that it is their combination and the harmonious development of the machine as a whole that gives it its well-deserved superiority. Its essential elements covering a heavy, well-built frame, parts milled wherever they are fitted together, giving an absolutely uniform construction and assembly of parts, and a high standard of workmanship, make the machine what it is—the best that can be built and ready for any service.



Cylinder Shaft Bearing

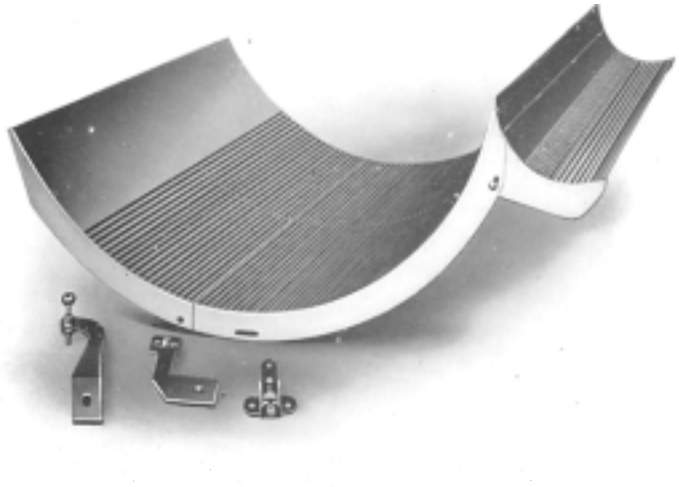
The Cylinder Shaft Bearings are removable bronze bushings, fitted in the pedestal boxes. In case of excessive wear, the bushing is easily replaced by a new one. The pedestals are so designed that an overflow of oil is prevented from getting on the cylinder and damaging the clothing.

The cylinders are 50 inches in diameter, either 40 or 45 inches wide, and are ground to an absolutely true surface, and accurate

balanced at a speed much higher than the customary working speed of the card, thus insuring perfect carding action of the clothing on the staple.

The Arches are substantial in construction, the outer rims and faces being machined to afford accurate backing for the flexible bends. The seatings for the flat disc and grinder brackets are milled at their proper locations on the arches.

The Front and **Back Plates** are attached to brackets held in adjustable positions on the arches. The plates are set concentric with the cylinder, and as the clothing wears, the position of the plates can be readily adjusted to conform thereto.



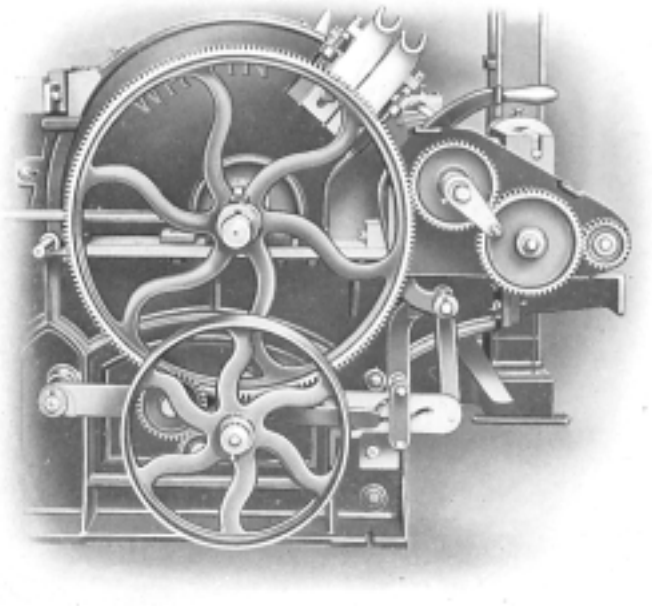
Cylinder and Licker-in Screen

The Flexible Bends are machined all over and polished on their outer surfaces. They are so formed that the flats may be set with extreme accuracy by means of five adjusting points on each side of the card.

The Cylinder Screen is made in two parts, of extra heavy tin and sheet steel, the grids being held in position by wire bracing, thus insuring maximum stiffness with maximum space for dirt to fall through. The screen is supported on sliding brackets readily

adjustable from the outside of the frame. The licker-in screen is hinged to the cylinder screen, and is fastened to the licker-in shields, so that the position of the screen is controlled by the setting of the licker-in.

The Knife Blades under the licker-in, which are used for removing motes, have an independent adjustment whereby they can be placed in varying positions to get more or less waste. When finally set and fastened in place, they conform to the movements of the licker-in and screen.



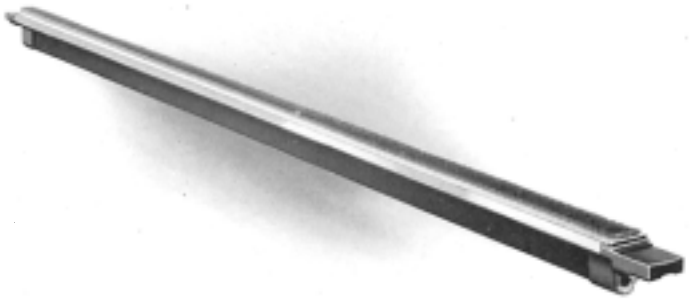
Doffer Slow-Motion

The Panels in the card side are made of light pressed steel, instead of cast-iron as formerly used. They are much easier to remove and are absolutely unbreakable.

The Doffing Cylinder is 27 inches in diameter and of width to correspond with the cylinder. By means of an efficient

Slow Motion the doffer may be run at a reduced speed at the option of the operative. This enables him to piece up an end with a minimum amount of waste. After the piecing of the end is accomplished, the slow motion may be thrown out and the doffer then resumes full speed.

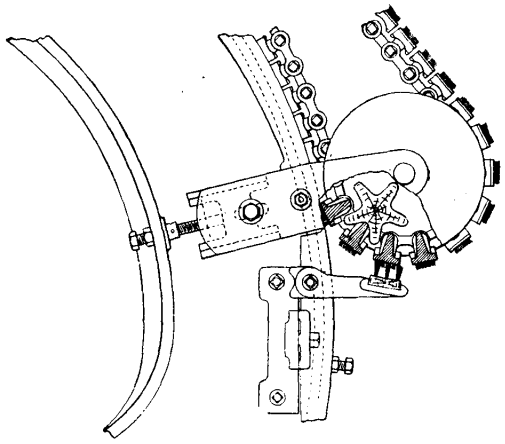
The Construction of the Flats is such that no deflection is perceptible while in their working positions. They are straightened and then ground to an even, smooth surface for the fitting of the clothing. The ends are milled on their working surfaces to the same curvature as the flexible bend on which they slide, thus insuring that all the flats will be alike for the grinding operation on their clothing. Each card is equipped with 110 flats, $1\frac{3}{8}$



Flat

inches wide, $\frac{13}{16}$ inch clothing face, 44 of which are in working position all the time. The clothing of the flats is securely fastened on each side by the Ashworth Serrated Steel Clips, which also affords additional means for the prevention of the deflection in the flats. The clothing on the ends of the flat is fastened by steel clips, which in combination with the side clips, insures that the clothing on every flat is stretched alike, and at an equal tension.

In order that the backs of the flats may be kept free from lint, the card is provided with a **Novel Clearer.** This consists of a wooden star-shaped roll of a length to fit loosely between the flat discs. The motion of the flat revolves the roll which, being covered with felt, collects the lint. It can be readily taken out to remove the accumulation of lint.

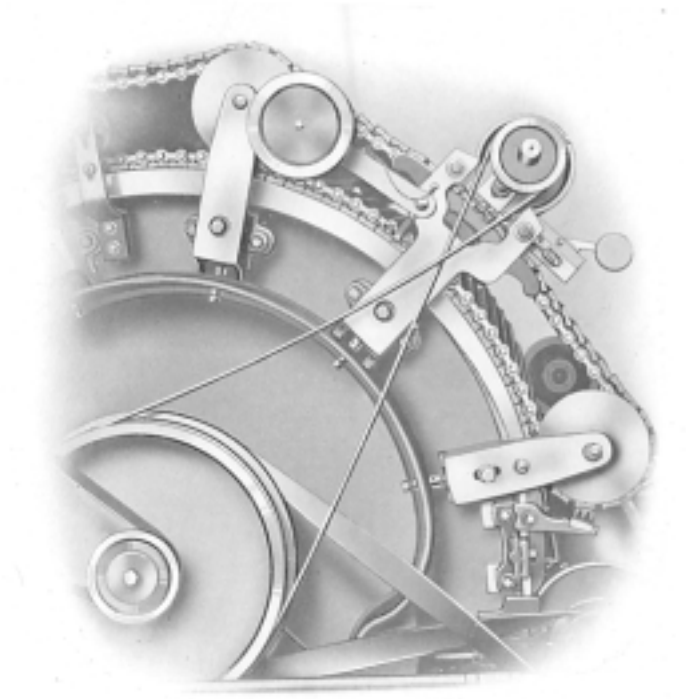


Flat Clearer

The Lamb Chain Take-up (patent pending) provides easily operated means for taking up the slack in flat chains, thereby acting as a preventative of damage to the clothing on the flats due to the slackness in the chains allowing the clothing to rub against the cylinder casing.

The Grinder-Motion for the flats is such that the flats are supported on the same surface and in the same plane while being ground as they are while carding, consequently the original pitch or heel is maintained with perfect accuracy, and when all the flats are in position on the flexible bend, they can be set to the cylinder by the same gauge. To facilitate the correct alignment of the grinding roll with the flats, the grinding-motion brackets are provided with our **Patented adjusting device**.

The Doffer Comb-Motion runs in oil, and the carefully made and highly efficient comb box allows a high speed to be maintained without heat or noise. Adjusting screws render it possible to set the comb within a few thousandths of an inch of the doffer without danger of injuring the clothing. Different speeds of the comb may be had by the use of double step pulleys.

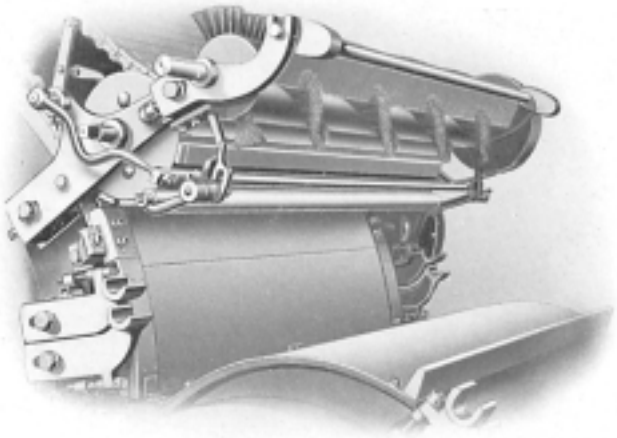


Flat Grinder

The Coiler is so constructed that the top cover may be lifted for oiling or cleaning, without breaking down the sliver while the card is running. Coilers are furnished for 10, 11 or 12-inch cans, as required.

A Fancy Roll may be had where heavy carding is required from cotton waste or other short staple. Its utility comes in by preventing the cylinder clothing from choking, and therefore rolling and nepping the fibre. As the surface speed of the fancy is in excess of that of the cylinder, the clothing of the fancy raises the cotton to the points of the cylinder clothing, from which it is easily removed by the doffer. Stripping of the cylinder is not required so frequently when a fancy is used, as without. The roll is made of wood and runs in bearings held in the usual cylinder grinding

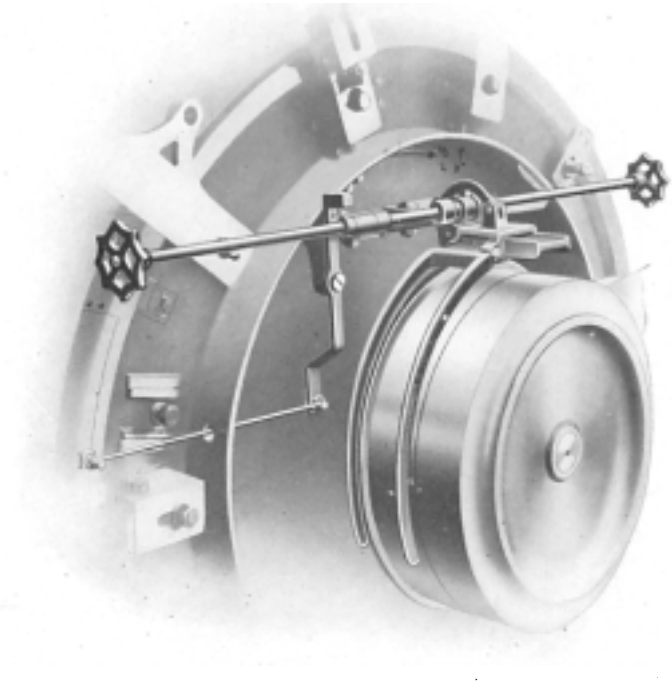
brackets. This renders it possible to easily remove the fancy for the purpose of grinding or stripping the cylinder. The roll is enclosed in a sheet-iron cover which effectually prevents the emission of dust and fly. If so ordered, the card will be made with



Thompson Stripper Roll

The Thompson Stripping Roll, which is furnished on all cards, is an arrangement for winding into a roll on the front of the card, the strippings as they are combed from the flats instead of allowing them to fall on the doffer cover, accumulate, and, if not removed, fall into the doffer, thus causing bad work.

The Driving Pulleys are 20 inches in diameter by 3 inches face, and should run 165 revolutions per minute. If desired, the card may be fitted with a belt shipping mechanism, and also a Front Cylinder-Door Locking Device. This latter feature (patented) is a preventative of accidents to operatives, as the door cannot be opened while the belt is on the driving pulley, neither can the card be started until the door is closed.



Belt Shipper and Card Door Lock

The Production (see tables, pages 33-34) depends on the quality required and grade of cotton used. On the following staples a card produces:

American,	100	to	200	pounds	in	10	hours.
Egyptian,	65	"	115	"	"	10	"
Peeler,	50	"	100	"	"	10	"
Sea Island,	30	"	70	"	"	10	"

Horse Power: See page 32.

Belting required:

Doffer belt	14′	6″	of 2″	belt.
Licker-in belt	9′	2″	" 2″	"
Flat belt	6′	0″	" $1\frac{1}{2}$″	"
Comb belt	16′	10″	" $\frac{3}{8}$″	round belt.
Brush belt	5′	1″	" $\frac{3}{8}$″	" "

NOTE—No allowance for lapping.

Weights:	40″ Card.	45″ Card
Net Weight	6200 pounds.	6500 pounds
Shipping Weight	6700 "	7100 "

Car Load: Four 40″ or 45″ cards, Boxed.

Floor Spaces outside 18 inches diameter lap and 10 inches coiler:

40″ card with 27″ doffer: 10′ 6″ by 5′ $5\frac{1}{4}$″ over all.
45″ " " 27″ " 10′ 6″ " 5′ $10\frac{1}{4}$″ " "

Extras required for every 20 cards:

One stripping roll for stripping doffers and cylinders.

One burnishing roll for burnishing clothing of flats, cylinders, and doffers.

One long grinder roll for grinding flats.

Two traverse grinders for grinding cylinders and doffers.

SPECIFICATIONS FOR REVOLVING FLAT CARDS

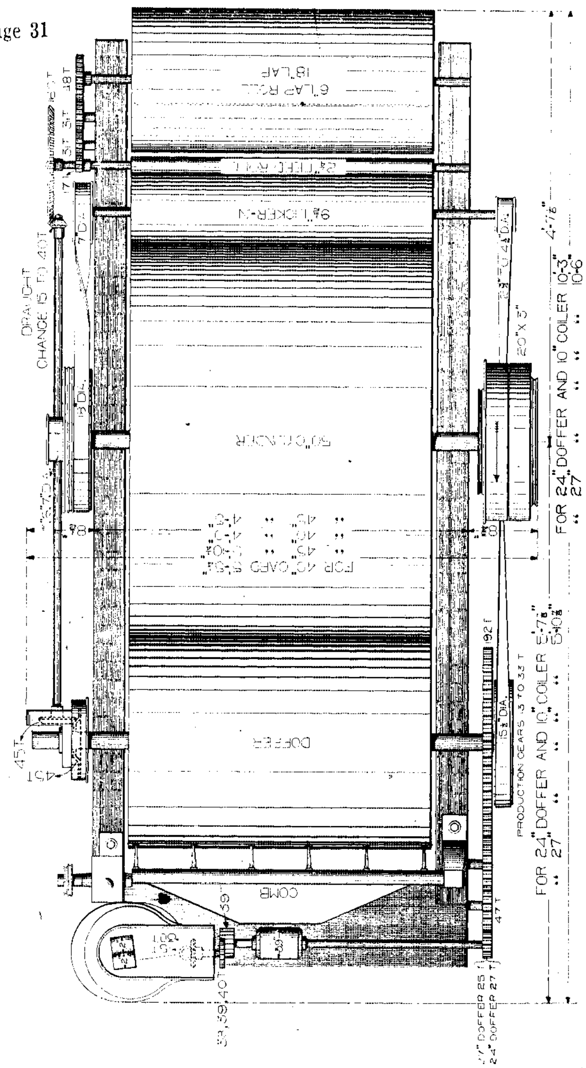
How many **Revolving Flat Cards?**
Width of Card?
How many each hand?
Driving Pulleys are 20″ x 3″.
Are Belt Shippers to be furnished?
Length of Cotton to be used?
Are Fancies wanted?
Weight of Lap per yard?
Width of Lap?
Number of Laps at back?
Single or Double Lap Rolls?
If Coilers are wanted, how many with each Card?
Diameter of Coiler Can?
Weight of Sliver per yard at Doffer?
Draft?
Production wanted per day of 10 hours?
Diameter Lickerin Pulley driving Doffer?
How many Long Grinder Rolls?
How many Traverse Grinder Rolls?
State preference, if any, as to number of points in Clothing?
State preference, if any, as to number of points in Cylinder?
State preference, if any, as to number of points in Doffer?
State preference, if any, as to number of points in Tops?
State preference, if any, as to number of points in Fancy?

NOTE:—Cylinders of Revolving Flat Cards are 40″ and 45″ wide x 50″ diameter. Belt from overhead. Metallic Lickerin $9\frac{1}{2}$″ diameter. Doffer 27″ diameter. 110 Top Flats $1\frac{3}{8}$″ wide, $\frac{13}{16}$″ on wire. The regular size of Lickerin Pulley driving Doffer is $4\frac{1}{4}$″ diameter, and this size will be furnished unless otherwise specified.

EXTRAS.

(Make of Clothing furnished at Builder's option unless otherwise agreed).

Fancy, 40″ Card.
Fancy, 45″ Card.
Double Lap Back.
2-Coiler Front.
Belt Shippers.
40″ Traverse Grinders.
45″ Traverse Grinders.
40″ Long Roll Grinders.
45″ Long Roll Grinders.
40″ Burnisher or Stripper Brushes.
45″ Burnisher or Stripper Brushes.
Clothing for Cylinders having No. 110's wire.
Clothing for Cylinders having No. 120's wire.



PLAN OF REVOLVING FLAT CARD

Horse Power of Whitin Revolving Flat Card.

Width of Lap 45 inches.

Weight 1 Yard of Sliver.	Production in 10 Hours.	Revolutions of Cylinder per Min.	Horse Power.
36 Grains	80 lbs.	165	.84
38 "	90 "	165	.90
40 "	100 "	165	1 00
46 "	110 "	165	1.06
48 "	120 "	165	1.12
52 "	140 "	165	1.19
56 "	148 "	165	1.24
60 "	158 "	165	1.30
64 "	177 "	165	1.37
68 "	190 "	165	1.40
72 "	200 "	165	1.45
76 "	220 "	165	1.53

The table shows that the power required is governed by the production.

Tests were made on a Webber Dynamometer.

Revolving Flat Card.

Cylinder 165 rev. Cyl. Pul'y 48″ dia. Licker-in Driven 7″ dia. Licker-in Driver 4¼″ dia.	Table showing number pounds Card Sliver produced in one day of 10 hours. Doffer 27¾ in. Diameter outside of Clothing. Number of Grains in one yard of Sliver.										Side Pulley 15¼″ dia. Doffer Gear 192 T.
Change Gear.	Rev. of Doffer per Minute.	38 LBS.	40 LBS.	42 LBS.	44 LBS.	46 LBS.	48 LBS.	50 LBS.	52 LBS.	54 LBS.	56 LBS.	Rev. of Doffer per Minute.
13T	7.88	65.37	68.81	72.25	75.70	79.13	82.57	86.01	89.46	92.90	96.33	7.88
14	8.48	70.34	74.04	77.73	81.44	85.14	88.85	92.54	96.24	99.95	103.65	8.48
15	9.09	75.41	79.37	83.35	87.31	91.28	95.25	99.22	103.18	107.15	111.12	9.09
16	9.70	80.48	84.71	88.95	93.18	97.42	101.64	105.88	110.12	114.35	118.59	9.70
17	10.30	85.44	89.93	94.43	98.92	103.43	107.92	112.42	116.91	121.40	125.91	10.30
18	10.91	90.50	95.27	100.03	104.79	109.55	114.31	119.08	123.84	128.60	133.36	10.91
19	11.52	95.57	100.59	105.62	110.66	115.68	120.71	125.74	130.77	135.81	140.83	11.52
20	12.12	100.54	105.83	111.12	116.41	121.70	127.00	132.28	137.58	142.87	148.16	12.12
21	12.73	105.60	111.15	116.71	122.27	127.83	133.38	138.94	144.50	150.05	155.61	12.73
22	13.34	110.64	116.48	122.30	128.12	133.94	139.77	145.59	151.51	157.24	163.06	13.34
23	13.94	115.64	121.73	127.81	133.90	139.98	146.07	152.15	158.25	164.33	170.42	13.94
24	14.55	120.69	127.04	133.39	139.75	146.09	152.44	158.80	165.15	171.52	177.85	14.55
25	15.15	125.68	132.29	138.91	145.52	152.13	158.74	165.36	171.97	178.59	185.20	15.15
26	15.76	130.74	137.62	144.50	151.38	158.26	165.14	172.02	178.90	185.79	192.66	15.76
27	16.37	135.80	142.94	150.09	157.23	164.38	171.52	178.66	185.82	192.96	200.11	16.37
28	16.97	140.78	148.18	155.59	163.01	170.41	177.82	185.23	192.64	200.05	207.45	16.97
29	17.58	145.83	153.51	161.17	168.85	176.53	184.20	191.87	199.56	207.23	214.90	17.58
30	18.18	150.81	158.74	166.68	174.62	182.56	190.49	198.43	206.36	214.30	222.24	18.18
31	18.79	155.88	164.08	172.28	180.49	188.69	196.89	205.09	213.30	221.51	229.70	18.79
32	19.40	160.94	169.40	177.87	186.34	194.81	203.28	211.75	220.21	228.70	237.16	19.40
33	20.00	165.91	176.85	183.37	192.10	200.83	209.57	218.30	227.03	235.77	244.49	20.00

NOTE:—In the above table 5 per cent. of the time is allowed for cleaning, stripping, etc.

Revolving Flat Card.

Cylinder 165 rev. Cyl. Pul'y 18" dia. Licker-in Driven 7" dia. Licker-in Driver $4\frac{1}{4}$" dia.

Table showing number pounds Card Sliver produced in one day of 10 hours.

Doffer $27\frac{3}{4}$ in. Diameter outside of Clothing.

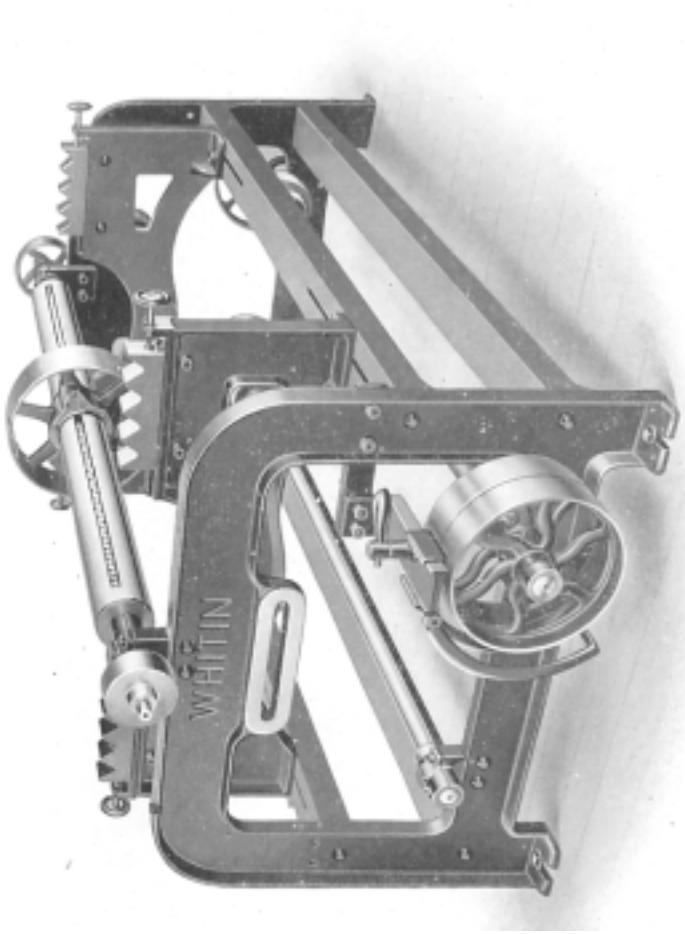
Number of Grains in one yard of Sliver.

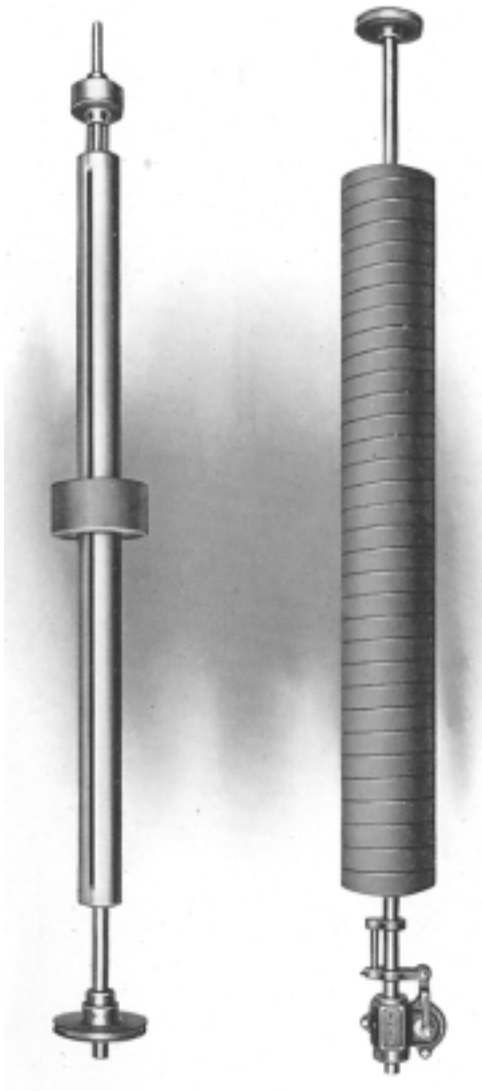
Side Pulley $15\frac{1}{2}$" dia. Doffer Gear 192 T.

Change Gear.	Rev. of Doffer per Minute.	58 LBS.	60 LBS.	62 LBS.	64 LBS.	66 LBS.	68 LBS.	70 LBS.	72 LBS.	74 LBS.	76 LBS.	Rev. of Doffer per Minute.
13T	7.88	99.77	103.22	106.67	110.10	113.53	116.98	120.42	123.86	127.31	130.74	7.88
14	8.48	107.36	111.05	114.75	118.46	122.16	125.87	129.56	133.26	136.97	140.67	8.48
15	9.09	115.09	119.06	123.03	127.00	130.97	134.93	138.91	142.87	146.84	150.81	9.09
16	9.70	122.82	127.06	131.30	135.53	139.77	144.00	148.24	152.48	156.71	160.95	9.70
17	10.30	130.40	134.90	139.39	143.89	148.39	152.89	157.38	161.88	166.37	170.88	10.30
18	10.91	138.12	142.89	147.65	152.41	157.17	161.93	166.70	171.46	176.22	180.98	10.91
19	11.52	145.86	150.90	155.92	160.96	165.98	171.00	176.05	181.07	186.11	191.13	11.52
20	12.12	153.45	158.74	164.04	169.33	174.62	179.91	185.20	190.49	195.77	201.08	12.12
21	12.73	161.17	166.73	172.28	177.84	183.40	188.95	194.51	200.07	205.63	211.18	12.73
22	13.34	168.89	174.71	180.53	186.35	192.18	198.00	203.82	209.64	215.47	221.26	13.34
23	13.94	176.50	182.58	188.67	194.77	200.84	206.03	213.02	219.11	225.20	231.27	13.94
24	14.55	184.20	190.56	196.91	203.27	209.61	215.96	222.32	228.67	235.03	241.36	14.55
25	15.15	191.82	198.43	205.05	211.66	218.28	224.89	231.51	238.11	244.74	251.34	15.15
26	15.76	199.55	206.43	213.31	220.19	227.07	233.95	240.84	247.71	254.60	261.47	15.76
27	16.37	207.25	214.40	221.55	228.70	235.85	242.99	250.14	257.29	264.43	271.58	16.37
28	16.97	214.87	222.27	229.68	237.10	244.50	251.91	259.33	266.73	274.14	281.54	16.97
29	17.58	222.58	230.26	237.93	245.60	253.28	260.95	268.62	276.31	283.98	291.65	17.58
30	18.18	230.18	238.12	246.05	253.99	261.93	269.86	277.80	285.74	293.68	301.61	18.18
31	18.79	237.92	246.12	254.32	262.53	270.73	278.93	287.13	295.34	303.54	311.74	18.79
32	19.40	245.63	254.10	262.57	271.04	279.51	287.97	296.44	304.91	313.39	321.86	19.40
33	20.00	253.23	261.96	270.69	279.43	288.15	296.88	305.62	314.35	323.09	331.81	20.00

NOTE:—In the above table 5 per cent. of the time is allowed for cleaning, stripping, etc.

Stationary Card Roll Grinder





Card Grinding Rolls

CARD GRINDERS

The most essential accessory in the Card Room is a reliable grinding apparatus. Without perfect grinding, the clothing for the Cards, although of the best quality and properly applied, will give unsatisfactory results.

In order that manufacturers may be assured of obtaining the best results, we are prepared to supply grinding apparatus of superior quality for cards from 36″ to 51″ wide.

The Stationary Card-Roll Grinder, shown on page 35, combines all the essential features necessary in the make up of a perfect grinder. The frame is particularly well adapted to the work it has to do, viz.: the grinding of the worker and stripper rolls, it being very heavy and strong and especially designed to resist vibration.

The Traverse Grinder and Long Grinder illustrated on page 36 are designed for both flats and rolls for all widths.

Our Patented Stripping Truck is a useful adjunct to Full Roller Cards. By means of this machine the workers and strippers are conveniently cleaned.

Roll Stripping Truck

COMBING

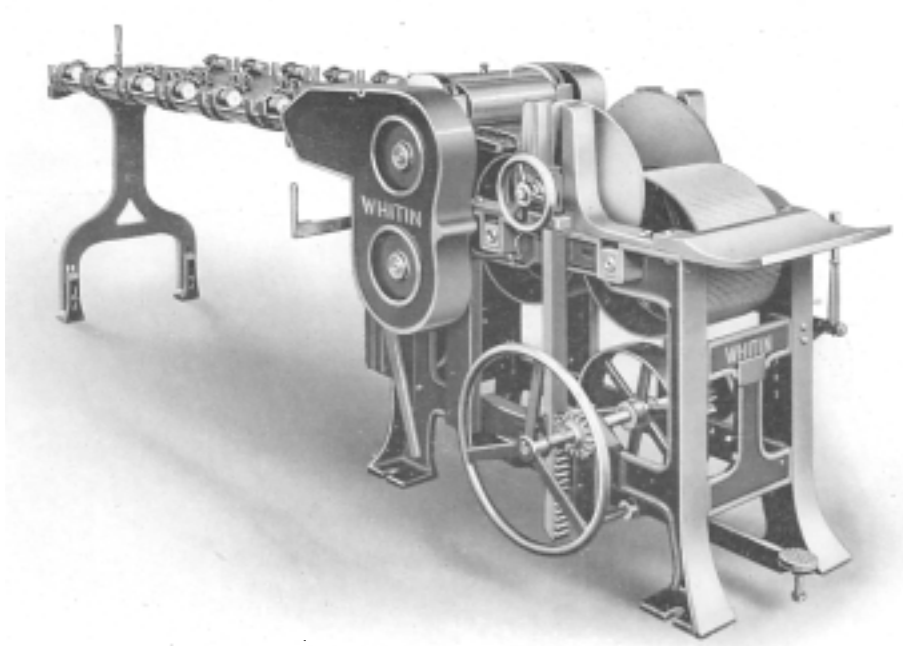
COMBING MACHINERY

With the introduction of the **Whitin Improved Comber**, whereby it has been made possible for the mill to obtain a large production, together with the best quality of work, the cost of combing and of the installation of combers has been reduced to such an economical point that today the comber is a machine which every mill should consider, if not as a necessity yet as a possibility in its organization of machinery. The simplification of the comber and its accompanying preparatory machines, the ribbon and sliver lap, are such that the question of skilled labor attendance is eliminated. From being considered one of the most complicated machines that the mill has to deal with, it is today one of the simplest in its operation and one of the least apt to give trouble to its attendants. Accordingly the field and usefulness of the comber have been widely extended from that of full-combed work to what is termed semi-combed work and the reclamation of good fibre from card flat strips. The fact that the same machine, owing to improved construction, can be used in the mill on both the longest and shortest staple, and the change from one to the other can be quickly accomplished with the simplest of adjustments, and the percentage of waste absolutely regulated, makes it a flexible unit in the mill. We particularly call to the attention of the trade what we term the **semi-combing** of moderate staple cottons, say staples running from 1 inch to $1\frac{3}{16}$ inches, whereby, with a minimum waste percentage, yarn can be produced which will equal the strength of carded yarns made from cotton $\frac{1}{16}$-inch to $\frac{1}{8}$-inch longer staple. These semi-combed yarns, as direct competitors of carded yarns, show more evenness, more lustre, and greater strength; and the saving in staple, with full attendance for waste taken out, and cost of the process, makes a material saving to the mill.

Before calling attention to the individual machines, it may be of interest to follow through briefly the combing processes as usually installed, whereby it will be seen that the whole process makes for

superior yarn in the paralleling of the fibres and the cleansing from them of impurities and all short and imperfect fibres.

First, 16 to 24 card slivers are taken, these slivers being delivered from the card with their fibres matted and tangled. These are formed into a lap by means of the sliver lap machine, which starts the paralleling of the fibres by putting in a draught from two to three. This lap goes to the ribbon lap machine, which doubles four laps into one, the purpose being to obtain additional evenness from the doublings and additional paralleling by its draught of between four and five. The laps from the ribbon lap machine are placed on the comber, which doubles eight into one. These fibres are now thoroughly straightened out and combed by the needles of the half-laps and top-combs. The short fibres and the impurities in the cotton are removed and a lustrous combed sliver delivered for the subsequent processes of the mill. It can, therefore, be readily seen that a yarn coming from a combed sliver must be more even, due to approximately 640 additional doublings, and smoother and more lustrous, due to the removal of the impurities and the frictional contact of the needles, and is stronger, owing to the absolute paralleling of the fibres. In the following pages we briefly describe the machines of the combing process in the order in which they are used in the mill. Where, however, a process of drawing is substituted for the ribbon lap machine we furnish the sliver lap machine in the $11\frac{3}{4}$ inches width.



Sliver Lap Machine

SLIVER LAP MACHINE

The object of the sliver lap machine is to form the sliver as it comes from the card or drawing frame into a lap suitable for use on the ribbon lap machine or comber. From 16 to 24 cans are placed at the back of the machine, the number depending on the weight and width of lap desired. The sliver is drawn from the cans through guides over lifting rolls equipped with stop-motions, onto a particularly efficient Derby back of special design, and there the slivers are drawn in parallel lines to a draw head consisting of three or four lines of top and bottom rolls arranged with a slight amount of draught. From the drawing rolls the web is passed through two pairs of heavy calender rolls and is then formed into a lap 12 inches to 14 inches in diameter either $9\frac{3}{4}$ inches or $11\frac{3}{4}$ inches wide, according to the size of machine it is to supply. The $9\frac{3}{4}$-inch lap machine is used to form laps for use in the ribbon lap machine, while the $11\frac{3}{4}$-inch machine is used where the ribbon lap machine is eliminated and the drawing frame substituted, the laps being taken in the latter case direct from the sliver lap machine to the comber.

The Draw-Box. of the $9\frac{3}{4}$-inch lap machine is fitted with three lines of top and bottom rolls, while that of the $11\frac{3}{4}$-inch machine has four lines. Metallic or leather covered **Top-Rolls** are furnished as ordered. The machine is Patented in certain of its essential features and is amply provided with **Stop-motions** in order to stop the machine when an end of silver breaks out at the back, and also when the lap reaches its full diameter. All gearing is thoroughly guarded with covers, preventing injury to operatives.

A Weight Relieving Motion is provided to remove pressure of the weights during any extended stoppage of the machine when leather-covered rolls are supplied. The construction is substantial, all fits being made on milled surfaces, and the machine generally highly finished.

Driving Pulleys: 24 inches in diameter by $2\frac{1}{2}$ inches face; the speed ratio of the driving pulleys being one revolution of the pulleys to one revolution of the 5-inch calender rolls.

Speed of the machines is according to the production required, being usually from 90 to 100 revolutions of the 5-inch calender rolls.

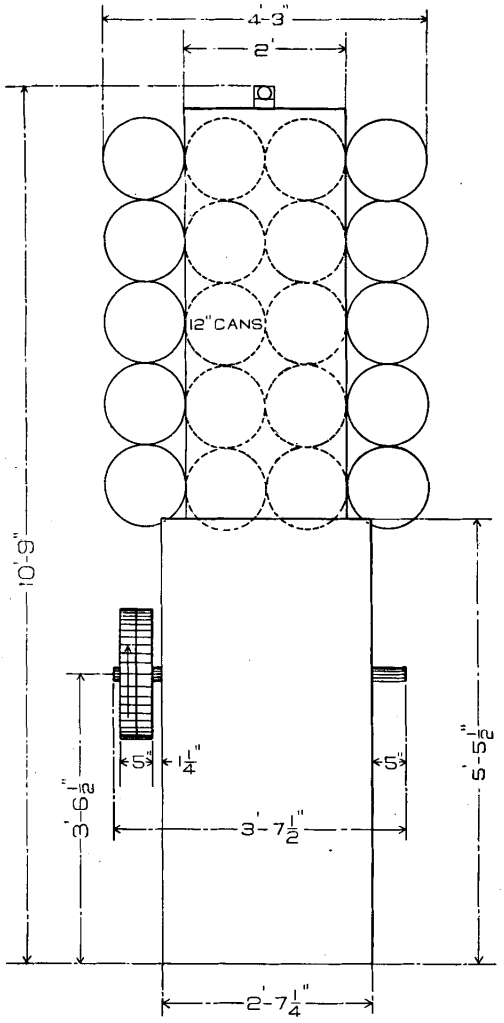
The production of one sliver lap machine is sufficient to supply six eight-head combers.

Power: $\frac{1}{2}$ horse power is required.

Floor Space: Including twenty 12-inch cans, 10 ft. 6 in. by 4 ft. 3 in.

Weights: Shipping weight, 2700 pounds; net weight, 2500 pounds.

Car Load: Two sliver lap and two ribbon lap machines, set up.



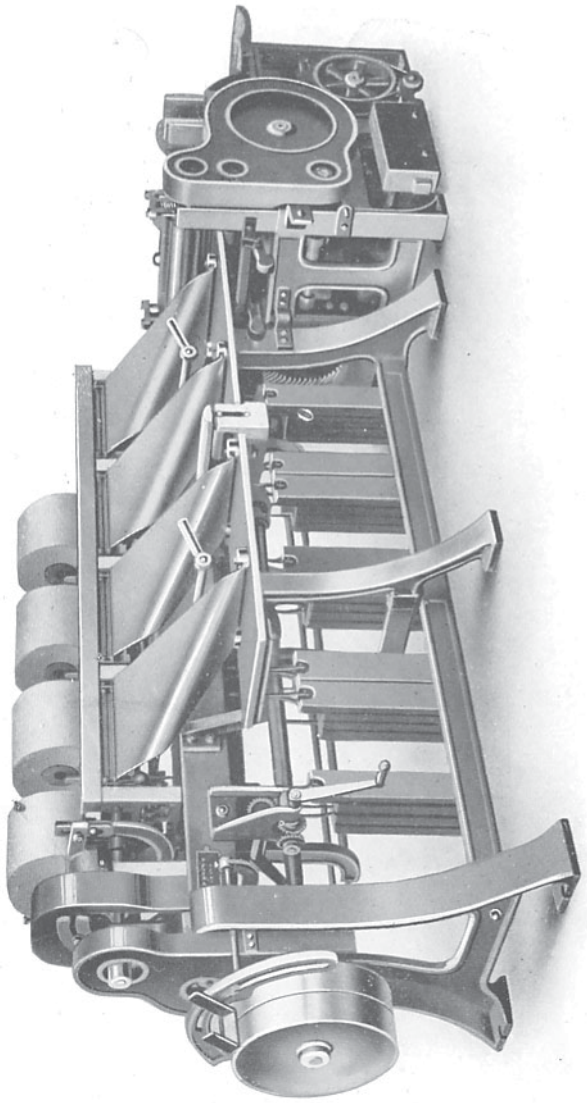
FLOOR PLAN OF SLIVER LAP MACHINE

Sliver Lap Machine

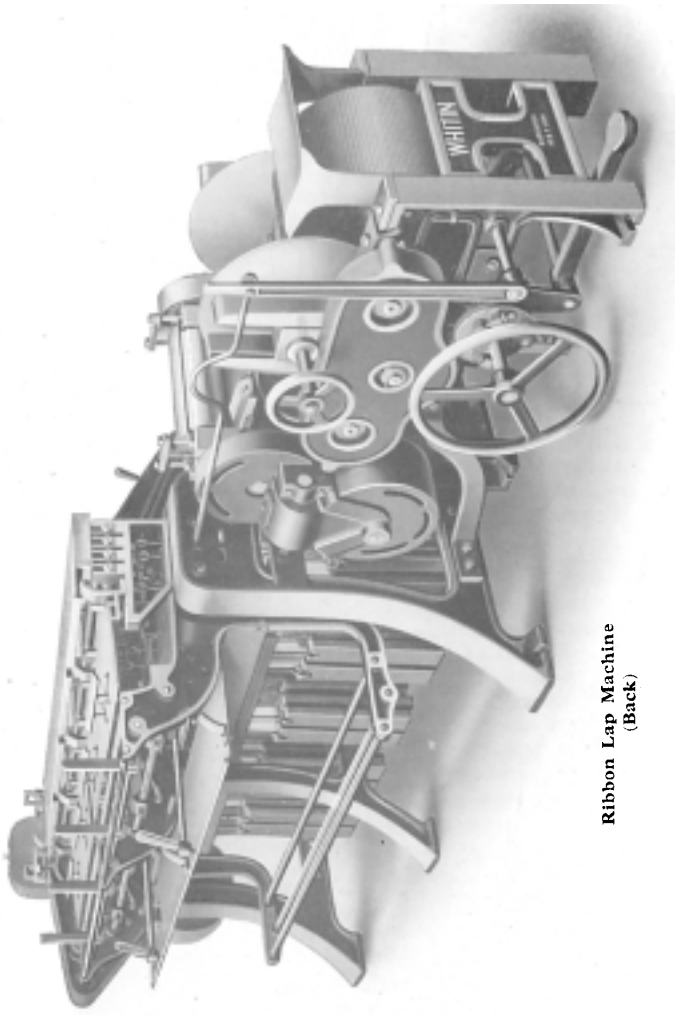
Production per day of ten hours, allowing 25 per cent off for oiling, cleaning, etc.

Revolutions per min. of 5 in. Calender roll	Grains per yard of lap produced													
	350	360	370	380	390	400	410	420	430	440	450	460	470	480
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
85	834.7	858.5	882.3	906.1	929.9	953.7	978.3	1001.3	1025.9	1049.7	1073.5	1097.3	1121.1	1144.9
90	883.8	909.0	934.2	959.4	984.6	1009.8	1035.9	1062.2	1086.3	1111.5	1136.7	1161.9	1187.1	1212.3
95	932.9	959.5	986.1	1012.7	1039.3	1065.9	1093.4	1119.1	1146.9	1173.2	1199.8	1226.4	1253.0	1279.6
100	982.0	1010.0	1038.0	1066.0	1094.0	1122.0	1151.0	1178.0	1207.0	1235.0	1263.0	1291.0	1319.0	1347.0
105	1031.1	1060.5	1089.9	1119.3	1148.7	1178.1	1208.5	1236.9	1267.3	1296.7	1326.1	1355.5	1384.9	1414.3
110	1080.2	1111.0	1141.8	1172.6	1203.4	1234.2	1266.1	1295.8	1327.7	1358.5	1389.3	1420.1	1450.9	1481.7
120	1178.4	1212.0	1245.6	1279.2	1312.8	1346.4	1381.2	1413.6	1448.4	1482.0	1515.6	1549.2	1582.8	1616.4

One revolution of driving pulley to one revolution of 5-inch calender roll.



Ribbon Lap Machine (Front)



Ribbon Lap Machine
(Back)

RIBBON LAP MACHINE

The object of the ribbon lap machine is to so prepare the laps for the comber that they will be subjected to a minimum waste in the combing operation and also by the addition of doublings add to the evenness of the work. The laps formed by the sliver lap machine are placed upon the lap rolls at the back of the ribbon frame, which deliver their sliver to four lines of top and bottom rolls arranged with the necessary amount of draught ranging from four to five. This draught parallels the fibre, and the resulting ribbons are carried over highly polished curved brass plates and formed one upon another upon the sliver plate, along which the resultant web is drawn through several pressing rolls to the lap head and there formed into a lap $11\frac{3}{4}$ inches wide and from 12 inches to 14 inches in diameter. The construction of this machine has been so simplified as to reduce the element of waste to a minimum.

Stop-Motions are provided, which instantly stop the machine whenever the sliver breaks down at the back, or when a lap in the creel breaks or runs out; a full-stop motion operates when the lap at the delivery attains its full diameter, and a third stop motion prevents breakage due to sliver lapping up on the front steel rolls.

Extra laps are carried in a **Low-Hung Creel** at the back of the machine, and are protected from lint and dust falling from above by sheet-iron guards of neat design. Owing to this novel construction, it is possible to operate the machine with small help.

The Drawing Rolls are made $1\frac{1}{8}$ inches, $1\frac{1}{4}$ inches or $1\frac{1}{2}$ inches in diameter, the sizes being governed by the length of the staple to be worked. Metallic or leather-covered top rolls are furnished as ordered. All gearing is thoroughly guarded with covers to prevent unjury to the operator, and the table on which the cotton is drawn is highly polished and nickeled so as to present minimum friction to the web passing over it.

A Weight-Relieving Motion is provided which removes the pressure of the weights during any extended stoppage of the machine, thereby preventing creasing of leather rolls.

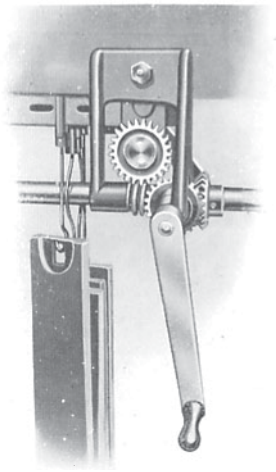
Driving Pulleys: 16 inches in diameter by 3 inches face, running at a ratio of three revolutions of the driving pulleys to one revolution of the 5-inch calender roll. Speed is regulated by the production desired, ordinarily from 90 to 100 revolutions of the 5-inch calender roll.

One ribbon lap machine is sufficient to handle six combers.

Power: 1 horse power is required.

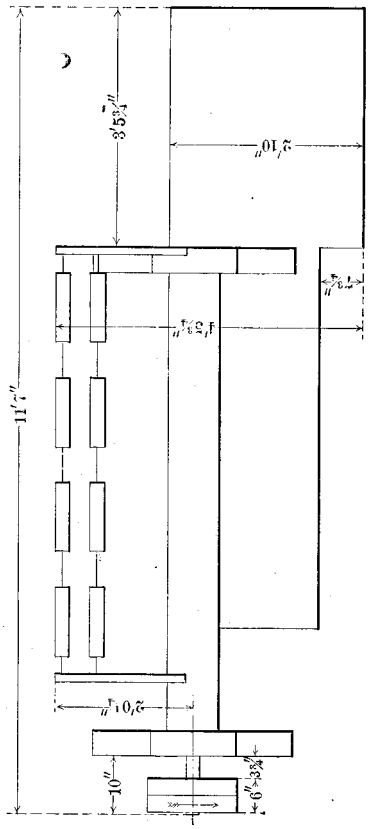
Floor Space: 11 ft. 7 in. by 4 ft. 6 in.

Weights: Shipping weight, 4250 pounds; net weight, 4100 pounds.



Weight-Reliever

Car Load: Two sliver lap and two ribbon lap machines, set up.



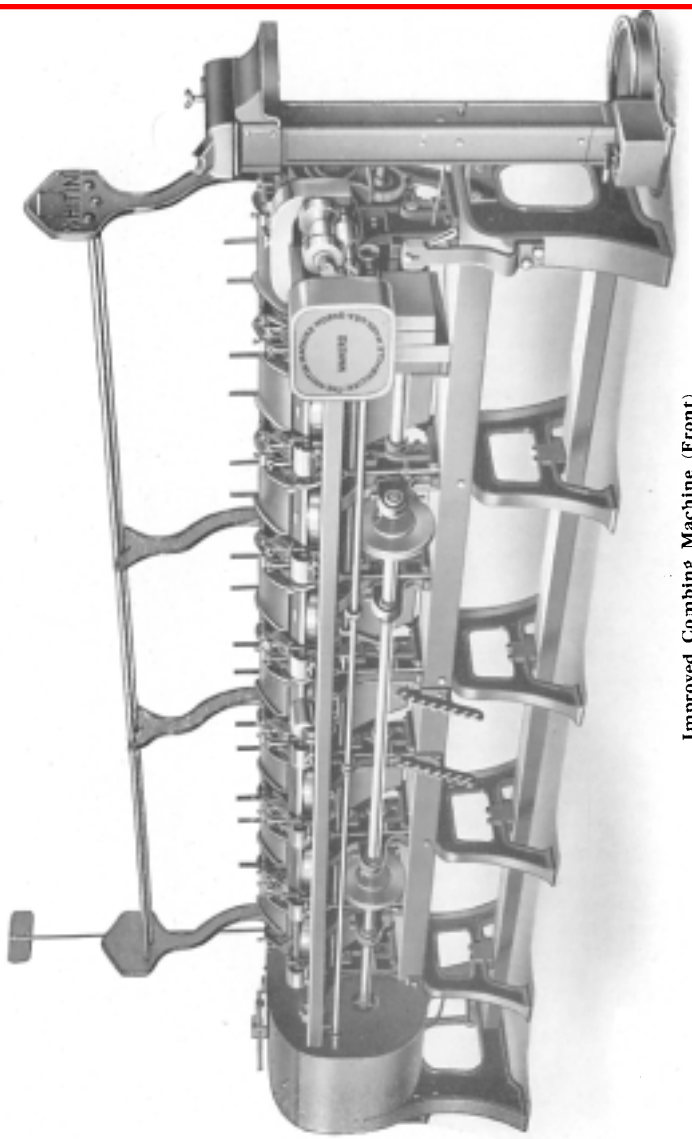
Floor Plan of Four Lap Ribbon Lap Machine

Ribbon Lap Machine

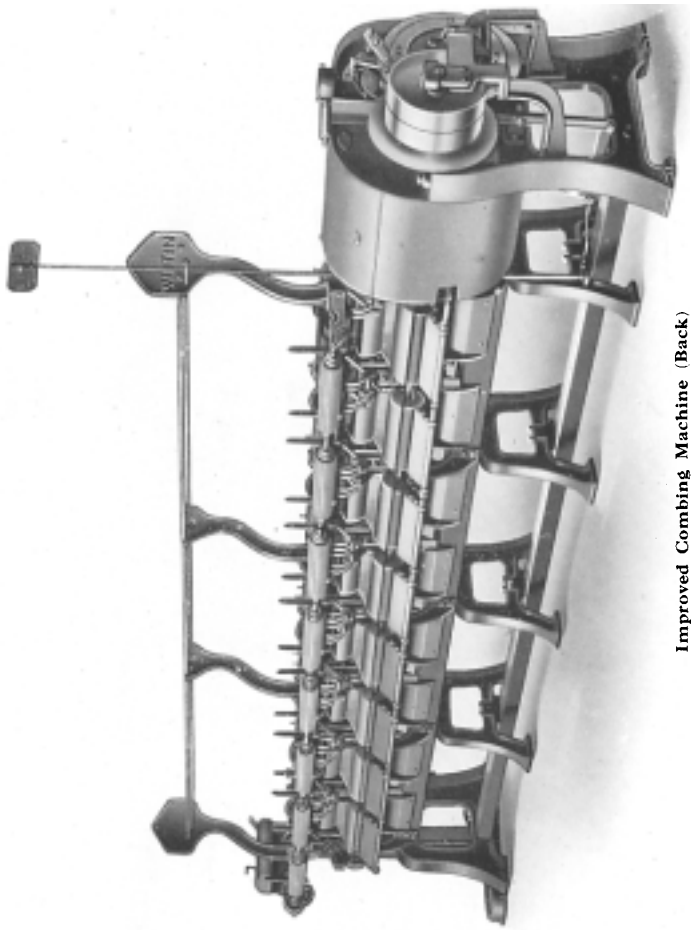
PRODUCTION PER DAY OF TEN HOURS, ALLOWING 25% OFF FOR OILING, CLEANING, ETC.

Revolutions per min. of 5 in. Calender roll	Grains per yard of lap produced													
	400	410	420	430	440	450	460	470	480	490	500	510	520	530
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
85	953.7	978.3	1001.3	1025.9	1049.7	1073.5	1097.3	1121.1	1144.9	1168.8	1192.6	1216.4	1240.2	1264.0
90	1009.8	1035.9	1060.2	1086.3	1111.5	1136.7	1161.9	1187.1	1212.3	1237.5	1262.7	1287.9	1313.1	1338.3
95	1065.9	1093.4	1119.1	1146.6	1173.2	1199.8	1226.4	1253.0	1279.6	1306.3	1332.9	1359.5	1386.1	1412.7
100	1122.0	1151.0	1178.0	1207.0	1235.0	1263.0	1291.0	1319.0	1347.0	1375.0	1403.0	1431.0	1459.0	1487.0
105	1178.2	1208.5	1236.9	1267.3	1296.7	1326.1	1355.5	1384.9	1414.3	1443.8	1473.2	1502.6	1532.0	1561.4
110	1234.2	1266.1	1295.8	1327.7	1358.5	1389.3	1420.1	1450.9	1481.7	1512.5	1543.3	1514.1	1604.9	1635.7
120	1346.4	1381.2	1413.6	1448.4	1482.0	1515.6	1549.2	1582.8	1616.4	1650.0	1683.6	1717.2	1750.8	1784.4

3 revolutions of driving pulley to 1 revolution of 5-inch calender roll.



Improved Combing Machine (Front)

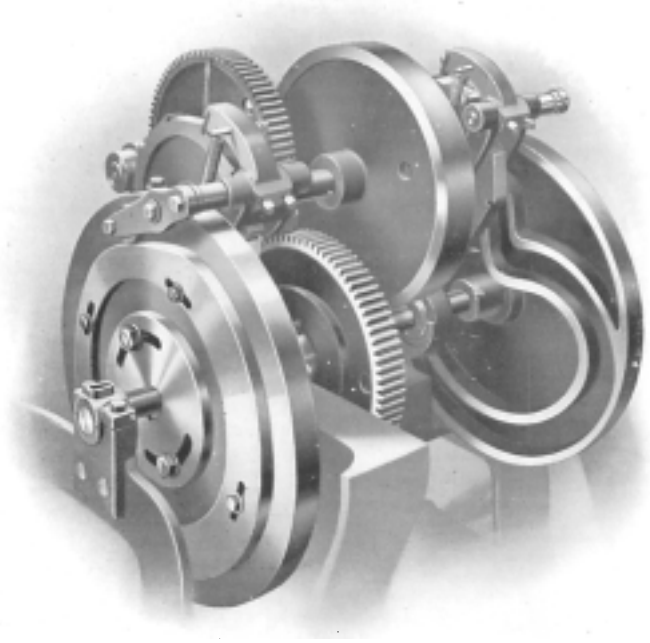


Improved Combing Machine (Back)

IMPROVED COMBING MACHINE

The Combing Machine, in the last few years, has been subject to more improvement, relatively, than any other standard machine used in the cotton mill.

Our Model D2 comber comprises new and novel features (patents pending) by means of which it is possible to obtain much closer adjustments than heretofore. With these close adjustments,



Detaching-Roll Mechanism

together with a novel arrangement of settings and timings, the waste percentages are more accurately regulated. Further, and of most importance, by use of these improvements the cotton is more thoroughly cleaned and combed on this machine, with a given percentage of waste, than has ever before been possible on any make of comber.

The Special Features to be noticed in the construction of this machine are as follows:

Absence of Vibration: Owing to the fixed position of several parts which formerly gave excessive vibration, as well as to the use of easy cam motions and **Patented** improvements, it has been possible to practically do away with the vibration of the machine and so obtain a much easier and simpler running mechanism, even at greatly increased speed.

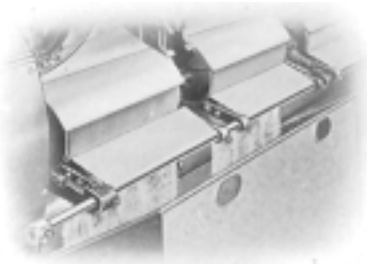
Simplified Settings and Adjustments: Adjustments on the machine may readily and quickly be made for all lengths of staple from $\frac{7}{8}$-inch to 2 inches.

Needle Lap

Automatic Stop-Motions. Automatic electric stop-motions of simplified construction, easily understood and accessible, cover every point where breakage of sliver is likely to occur. A telltale signal immediately communicates the stoppage of the machine to the operative. This stop-motion reduces to a minimum the responsibility of the operative in the care of the machine, and one operative is enabled to attend to eight eight-head combers with perfect ease. Also, through the use of our **Patented** devices for handling waste at the back of the comber, the extra yardage or cotton on laps, due to the increased size, the simplicity of the machine and system of gear covering, the care of the machines and handlings are reduced to a minimum; and it is possible for

the operative to attend a greater number of deliveries and handle the increased production with greater ease than heretofore.

The use of our **Improved Sliver Pan** tends to produce a very smooth sliver on the table and also has eliminated the possibility of slugs being drawn into the work from the corners of the pan, which has always been a source of trouble on all combing machines.



Waste Packer

As on the ribbon and sliver lap machines, the **Patent Weight-Relieving Motions** release the weight from the leather detaching-rolls when the comber is stopped for any length of time.

Accuracy of Adjustment. The percentage of waste can be closely controlled between six and twenty-four per cent. with absolute accuracy on appropriate grades of cotton. The change from one stock to another is readily made and practically no adjustment is necessary.

The Machine is built with eight heads, the laps 12 inches in width. All parts are highly finished; gears and cams are cut, to give quiet and easy running, and thoroughly guarded with covers, which can be readily opened for cleaning and oiling. All parts are made on jigs and templates, so that no trouble is experienced in replacing parts, should occasion require.

Optional Equipment: Instead of the usual method of doffer and comb motion for removing waste at back of comber the **Roth Aspirator** may be had which consists in substituting a perforated drum for the doffers, the waste being drawn from the cylinder brushes by suction. A fan located at back of the comber draws the waste from the brushes to the drum which revolves slowly and the waste is led in form of a fleece into boxes at the back of the machine. By this method of handling the waste, less cleaning of the machine is required. The needle half-laps and brushes are always clean and never become filled up and no dust flies about the machine.

The Production of the machine depends upon the grade of cotton used and the class of work desired: roughly speaking, anywhere from 600 to 1000 pounds per week of sixty hours, of combed sliver. Coilers can be furnished 9 inches, 10 inches, 11 inches and 12 inches in diameter.

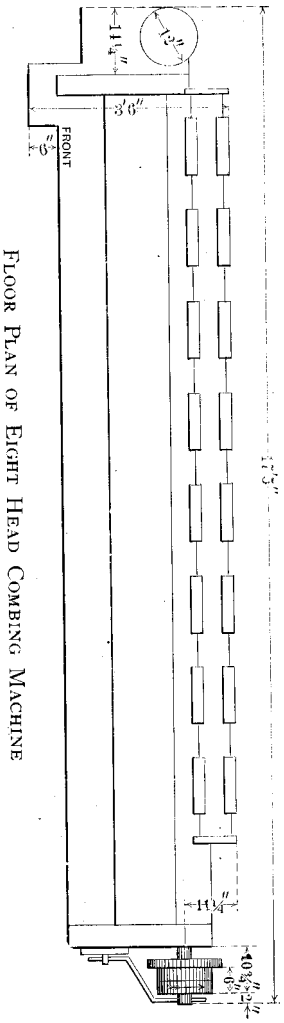
Driving Pulleys: 12 inches in diameter by 3 inches face, running 2.66 revolutions to one nip of the comber. The speed recommended is around 130 nips per minute on short stock and coarse work to 120 nips per minute on long stock, laps to weigh from 450 to 550 grains per yard.

Power: $\frac{1}{2}$ horse power at 130 nips per minute.

Floor Space: 17 ft. 5 in. by 3 ft. 6 in.

Weight: Shipping weight, 5000 pounds; net weight, 4600 pounds.

Car Load: Four machines, set up.



FLOOR PLAN OF EIGHT HEAD COMBING MACHINE

Production Table of Whitin Improved Comber

Showing the number of pounds of Combed Sliver produced in one day of ten hours allowing 5% off for cleaning, oiling, etc.

Coiler connection gear 50 teeth.

Nips per min.	Grains per yard of Combed Sliver.																	
	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
100	68 22	71.63	75.04	78.45	81.86	85.27	88.68	92.09	95.50	98.91	102 32	105.73	109.15	112.56	115.97	119.38	122 79	126 20	129 61
105	71 63	75.20	78.79	82.37	85.95	89 54	93.12	96.70	100 28	103.86	107.44	111 02	114.60	118.19	121.77	125.35	128.93	132 51	136 09
110	75.04	78.79	82.54	86.30	90.05	93.80	97.55	101.30	105.05	108.80	112.56	116 31	120.06	123.81	127.57	131 32	135.07	138.82	142 57
115	78 45	82.37	86.29	90.22	94.14	98.06	101.98	105.90	109.83	113.75	117.67	121 59	125 52	129.44	133 36	137.28	141 21	145.13	149.05
120	81 86	85.95	90.05	94.14	98.23	102 33	106.41	110.51	114.60	118.70	122.79	126.88	130 98	135 07	139.16	143.25	147.35	151.44	155.53
125	85 27	89.54	93.80	98.06	102.33	106 59	110.85	115.12	119.38	123 64	127.91	132.17	136 44	140 70	144.96	149.23	153.49	157.75	162 02
130	88.68	93.12	97.55	101.99	106.42	110 85	115 29	119.72	124.16	128.59	133 02	137.46	141 89	146 33	150.76	155.19	159.63	164.06	168 50

2.66 revolutions of driving pulley to one nip.

SPECIFICATIONS FOR COMBING MACHINERY

How many **Sliver Lap Machines**?
Width of Lap?
Right or Left Hand?
Weight of Sliver at back?
How many Doublings into one?
Draft?
Driving Pulleys are 19″ Dia. x 2½″ Face.
Belt from Above or Below?
Diameter of Bottom Rolls?

How many **Ribbon Lap Machines**?
Number of Heads each?
Width of Lap?
Right or Left Hand?
Weight per yard of Lap at back?
Draft?
Driving Pulleys are 16″ Dia. x 3″ Face.
Belt from Above or Below?

How many **Combing Machines**?
Number of Heads each?
Width of Lap?
Right or Left Hand?
Driving Pulleys are 12″ Dia. x 3″ Face.
Belt from Above or Below?
Weight per yard of Lap at back?
Total Draft in the machine?
Feed Gears?
Weight of Coiler Sliver?
Production per 10 hours per machine?
Percentage of Waste?
Nips per minute?

Coiler Connection Gear?
Diameter of Coiler Can?
Length of Cotton to be used?
Are Ermen Clearers to be furnished?
Are Hank Clocks to be furnished?
Are Combers to be equipped with Roth Aspirators?

NOTE:—**Sliver Lap Machines** are built 1½″ Diameter Metallic Rolls and Derby Back, unless otherwise specified. We allow 1 Top Roll extra when Leather Top Rolls are furnished; also 3 Change Draft Gears.

We allow 1 Top-Roll Extra for each delivery of **Ribbon Lap Machine** when Leather Top-Rolls are furnished; also 3 Change Draft Gears.

We allow 1 Top-Roll Extra for Draw-Box on **Combing Machine**; also 2 spare Leather Covered Detaching Rolls; also 3 Change Feed Gears.

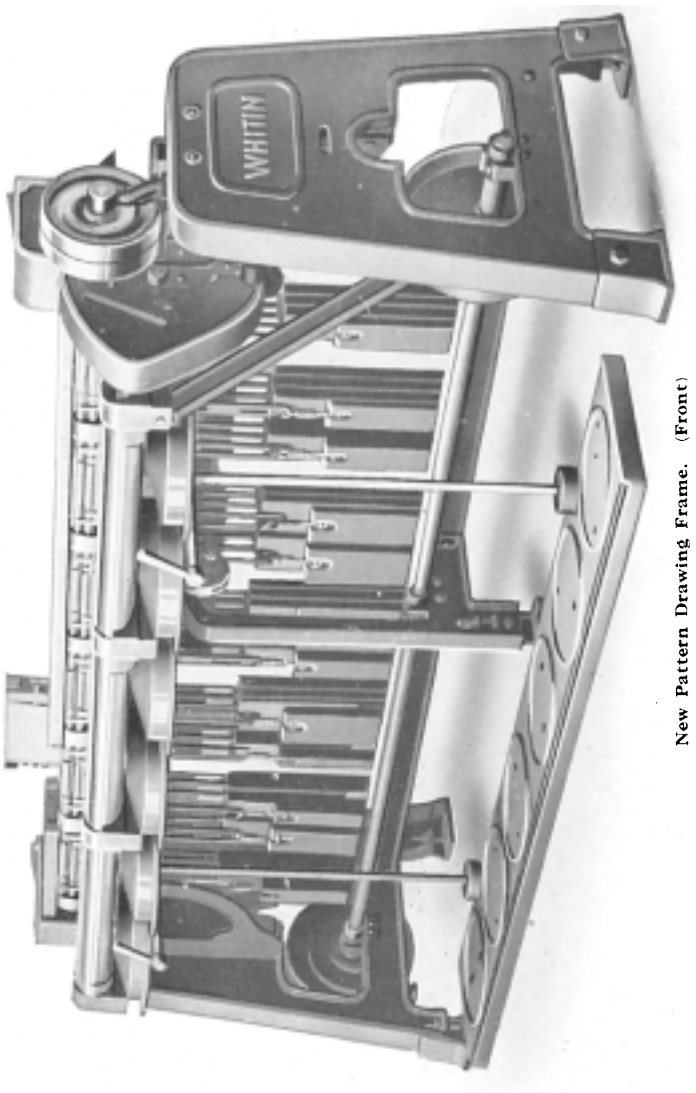
Extras;

Ermen Clearers.
Hank Clocks.
Roth Aspirators with Ballbearing Fan. Price on application.

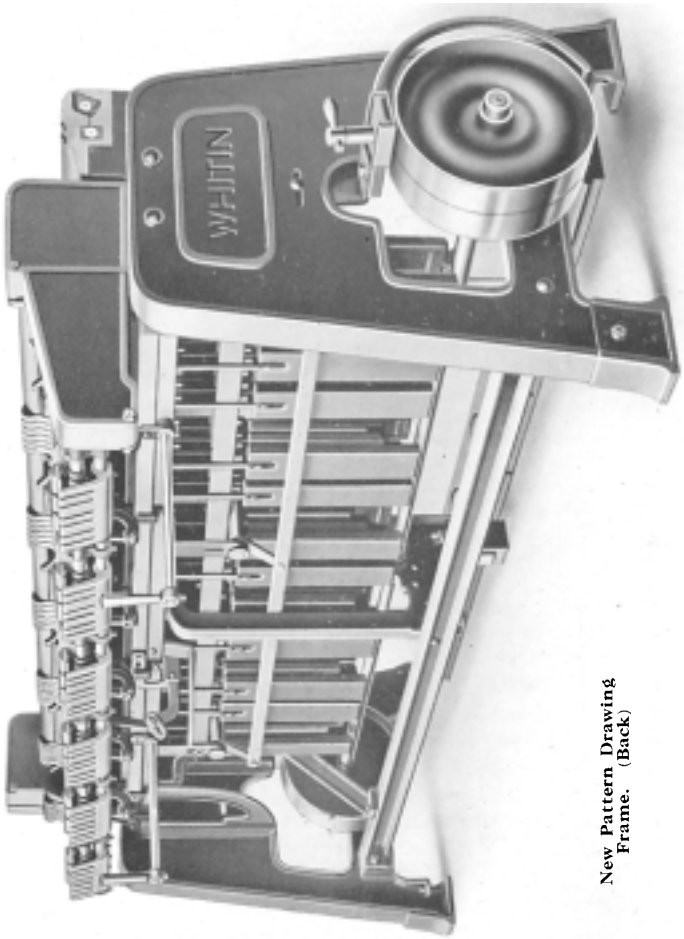
The following Supplies will be furnished with these machines unless otherwise ordered. Price on application.

Sliver Lap Spools, 9¾″ long x 4½″ diam. x 1 17/32″ bore.
Ribbon Lap Spools, 11¾″ x 4½″ diam. x 1 17/32″ bore.
Galvanized Steel Waste Cans.
Half-Laps
Top-Combs.
Leather Covered Detaching Rolls.


DRAWING



New Pattern Drawing Frame. (Front)



New Pattern Drawing Frame. (Back)

THE WHITIN

New Pattern Drawing Frame

The Whitin New Pattern Drawing Frame is a well designed machine, which has been placed on the market in the last seven years, and of which we have many thousand deliveries in successful operation today. It is the result of considerable experiment and study, and we believe is the most perfect and practical machine of this character which has ever been produced. In its construction we have, first of all, arranged for a strong and rigid frame, using a special girt which so distributes the weight of the machine as to avoid the tendency towards top-heaviness, apparent in drawing frames of previous designs.

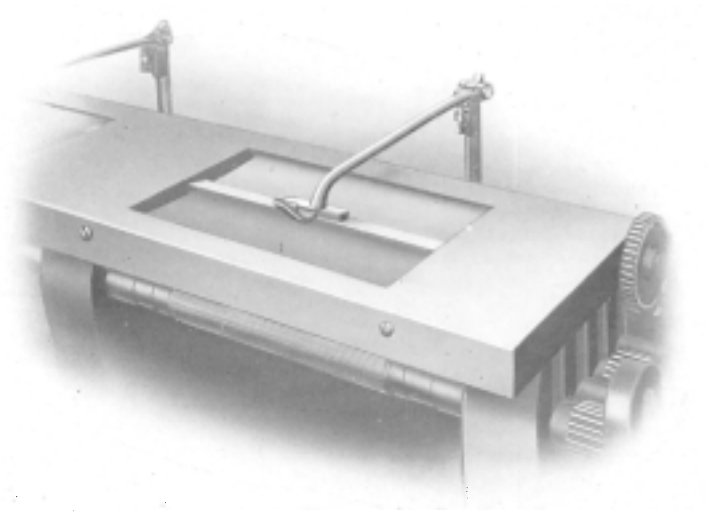
The type of **roll stand** used and arrangements for settings are extremely simple, and easily adjusted for different lengths of staple. The stop-motions are mechanical throughout, and constructed with the fewest number of parts possible. In the passage of the cotton from the can through the frame it encounters the least possible friction with stationary parts. The sliver spoons furnished are either of nickeled cast iron or stamped sheet metal, as the character of the work warrants.

The Workmanship is up to our best standard in every respect. The machine is highly polished; the construction is unusually strong and rigid; the tables are extremely heavy, being supported by rugged end legs, and a middle support; and the whole frame is not only tied together by the table, but also by a tie bar. Adjustable feet are provided, which ensure levelling of the frame on its own construction, rather than by wooden blocking placed underneath.

As a whole, we believe this frame will commend itself to practical men as a machine built not only for today, but for the future. The details of its construction are interesting, and attention is called to the following points:

The Drawing Rolls are made of crucible steel, arranged in four lines of bearings, 16″ apart on centers. These bearings are provided with brass steps to form smooth wearing surfaces. The customary diameters of the rolls are as follows: $1\frac{3}{8}$″ diameter

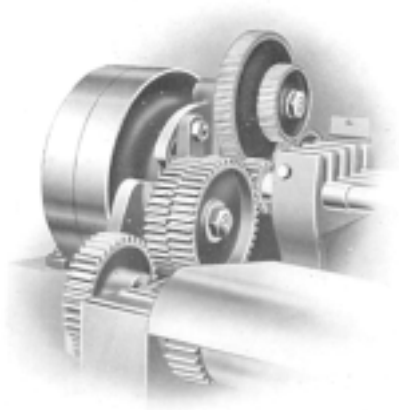
bottom front rolls; $1\frac{3}{8}''$ for the three bottom back rolls. The top-rolls are all $1\frac{1}{8}''$ in diameter. The top-rolls are either leather covered, or both the bottom and top-rolls are metallic. Where it is desirable to run the shorter grades of cotton, $1\frac{1}{8}''$ or $1\frac{1}{4}''$ bottom front roll is used in place of the $1\frac{1}{8}''$ roll. This latter arrangement allows the rolls to be set much closer to the length of the staple, and is desirable on $1''$ staple or less. Uneven work coming from wide settings on the drawing frame causes trouble throughout the mill. For most classes of work, our **metallic rolls** are strongly recommended. The metallic roll, properly constructed and set



gives a more even drawing than a leather roll. You can set $\frac{1}{16}''$ closer with a metallic roll of the same diameter than you can with a leather roll. They eliminate the trouble and expense common with leather rolls. They give at least 25% greater production at the same roll speed. In our construction, both common and metallic rolls are made with loose-end bearings, which possess the advantage of being easily oiled, without the necessity of removing the weights or the stopping machines. The weight hooks are not in contact with the moving surfaces of the rolls, and also, for this

reason, eliminate friction. Direct weighting of the top-rolls is used, and where leather top-rolls are specified, a **weight relieving motion** is supplied for taking the pressure from the top-rolls when the machine is not in operation, this preventing the flattening or marking of the leather rolls by the bottom steel rolls.

The matter of **Clearers** for top-rolls is taken care of by the usual stationary top-clearer having a cast-iron cover and using our Patented clearer cloth holder which keeps the cloth always in contact with the rolls. We would also call attention to the **Ermen Top Roll Clearer** which can be applied, if desired. In this type of clearer the cloth revolves and is cleaned by a comb, so that the surface presented to the rolls is always clean, and there is no need of lifting the cover and "picking" the clearer. Better and cleaner work is the result, and there is no breaking down of ends due to slugs passing through. Also as the clearer cover need not be lifted, there is no tendency for the rolls lapping up.

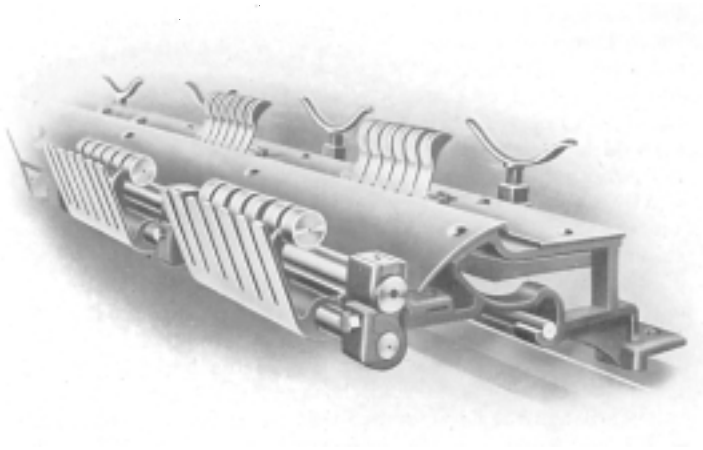


Draught Gearing

The Calender Rolls are made of steel, 3″ in diameter, the driving calender roll running in fixed bearings, while the front calender roll bearings, placed above the center of the back roll, are movable in inclined bearing seats by means of which the weight of the roll effects a thorough condensation of the sliver. A particularly desirable feature of the frame is found in the arrangement of the calender roll covers, these being inclined in such a way that the sliver does not touch the cover in its passage from the front roll to the trumpet thus preventing the collection of dirt

in the sliver, and doing away with the tendency to breakage of the web at this point, which very often occurs with the old-style straight cover.

The Draught Gear is easily and quickly changed by means of a swivel adjusting stand which is concentric with the front roll gear. Also in order to meet the varying weather conditions and differences in stock, which sometimes render it necessary to make a slight alteration in the draught between the front and the calender rolls, in order to take up the sag of the web, three compensating gears are furnished.



Lifting-Rolls

Mechanical Stop-Motions are furnished throughout, consisting of Front, Back, and Full Can Stop-Motions. The sliver trumpet is removably held in the holding lever, and is so adjusted that it not only stops the frame when the sliver breaks between the front and calender roll, but can be set by means of a sliding weight to knock off for a light sliver when a portion of the front sliver is lapping on the front roll. The convenient arrangement of the stop-motions, and the novel method in which they are set so as to provide for the most economical running of the various staples of cotton, are the subject of several Patents.

The Finger Heads, or sliver guides, are also made so that it is impossible for one sliver to ride over onto another. The openings are small enough at the bottom to prevent the sliver from running" bunchy" or snarling up, yet wide enough at the top for the silver to be easily thrown or dropped in.

The Stop-Motion at the back consists of accurately balanced sliver spoons acting in conjunction with the usual knock-off motion.

On combed work, or where an especially short staple cotton, or a very light sliver is to be worked, which breaks back easily, a **Back Lifting-Roll Motion** is used consisting of a line of steel rolls, with plain top cast-iron rolls, suitable in length for two slivers. This aids in the quick action of the stop-motion,and especially prevents poor work due to an end breaking down just back of the drawing rolls. When a sliver breaks at this point, due to defective coiling in the can, the weight of the end may still hold the spoon down and prevent the proper working of the back stop-motion. When the lifting roll is used, however, the break must come between it and the sliver can, so that the stop-motion has ample opportunity to act before the broken end reaches the drawing rolls.

Can Table

Cut-Tooth Gearing is used everywhere throughout the frame, and insures a quiet and easy running machine. The gearing is also effectively guarded with covers, which, acting with our **Patented Automatic Locking Devices,** avoid any liability of accident to the operatives while oiling or cleaning, it being impossible to start the machine with any of the gear covers open.

The Finish of the Frame is in keeping with the general effort on our part to make it embody the best of everything, nearly all the parts being polished. The bearings used throughout are grooved with the patent Osgood Oil Groove, allowing perfect lubrication, so that the machine runs smoothly, and without vibration.

The Can Tables and Can Table Plates are turned on their bearing surfaces so that they run easily and quietly. On these can tables the cans necessarily always run plumb, giving a good even coil of sliver which will draw out of the can at the next operation without snarling.

Driving Pulleys on the lower shaft are from 8″ to 16″ in diameter, and from 2″ to $5\frac{1}{2}$″ face, running one revolution to $1\frac{5}{11}$ revolutions of the front roll.

The excessive wear common to old style drawing frames in the bearing of the loose pulley on the front roll arbor has been eliminated in this frame by mounting the loose pulley on a sleeve which is integral with the support of the arbor; when the belt is on the tight pulley, the loose pulley does not revolve.

The frames are built in heads of from 3 to 6 deliveries each, fitted for either 10, 11 or 12″ cans.

Floor Lengths, exclusive of driving pulleys and sides of frames, are as follows:

3	deliveries	.....	5	feet 8	inches.
4	"	.....	7	" 0	"
5	"	.....	8	" 4	"
6	"	.....	9	" 8	"

To obtain length of frame over all, add 14″ to above lengths. To economize in floor space, two or more tables may be coupled together. For width see plan, page 73.

Production: See tables, pages 74, 75.

Horse Power: Four deliveries per horse power.

Weights: Shipping weight, 600 pounds per delivery; net weight 540 pounds per delivery.

Car Load: Five frames of six deliveries each, set up.

SPECIFICATIONS FOR DRAWING FRAMES

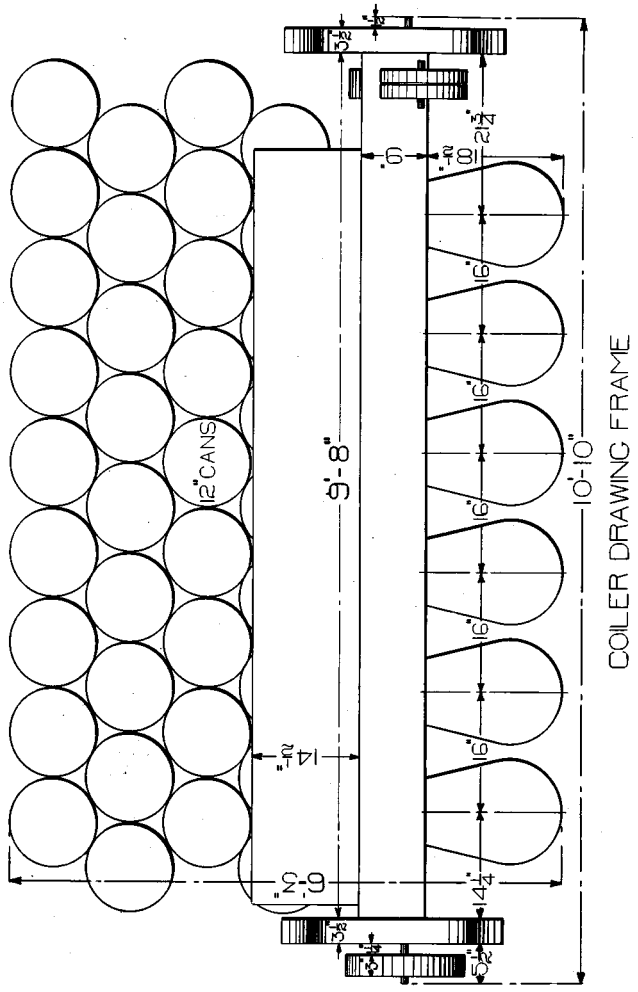
How many **Drawing Frames**? (One Frame may contain any number of Heads).

How many Heads in each Frame?
How many Deliveries per Head?
Total number of Deliveries?
Weight of Sliver at Back?
How many Doublings into One?
Draft?
Diameter of Coiler Can?
Interlocking Metallic or Loose End Leather Covered Top-Rolls?
Diameter of Bottom Front Roll?
Dia. and Face of Driving Pulleys on end of Bottom Shaft?
Are above Driving Pulleys to be Single, or Tight and Loose?
Which Hand are Frames to belt when facing Coilers?
Length of Cotton to be used?
Is Back Lifting-Roll to be furnished?
Are Ermen Clearers to be furnished?
Is Traverse Motion to be furnished?
Are Hank Clocks to be furnished?

NOTE:—All Frames will be painted **Black** unless otherwise specified. We allow three sets of Change Draft Gears.

EXTRAS.

Metallic Rolls (Top and Bottom Rolls).
Case hardening Metallic Rolls.
Ball bearing Top-Rolls, 4 lines.
Back Lifting-Roll.
Ermen Clearers.
Traverse Motion.
Hank Clocks.


COILER DRAWING FRAME
10'-10"
5'-8"
12" CANS
9"
18 1/2"
21 1/4"
16"
16"
16"
16"
16"
14 1/2"
6'-3"
14"
5 1/2"
5 1/2"

Production of Drawing Frame

1⅜-INCH FRONT ROLL

Table showing number of pounds Drawing Sliver produced in one day of 10 hours, allowing 20 per cent, for cleaning, oiling, etc.

Rev. of Front Roll Per. Min.	Number of Grains in one yard of Sliver.																	
	35		40		45		50		55		60		65		70		75	
	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll.	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll
250	74.6	97.7	85.3	111.7	96.0	125.7	106.6	139.6	117.3	153.6	127.9	167.5	138.6	181.5	149.3	195.5	159.9	209.4
260	77.6	101.6	88.7	116.2	99.8	130.7	110.9	145.2	122.0	159.7	133.1	174.2	144.1	188.8	155.2	203.3	166.3	217.8
270	80.6	105.5	92.1	120.6	103.6	135.7	115.1	150.8	126.7	165.9	138.2	180.9	149.7	196.1	161.2	211.1	172.8	226.2
280	83.6	109.5	95.5	125.1	107.5	140.7	119.4	156.4	131.4	172.0	143.3	187.6	155.2	203.3	167.2	219.0	179.1	234.6
290	86.6	113.4	98.9	129.6	111.3	145.8	123.7	162.0	136.1	178.1	148.4	194.4	160.8	210.5	173.2	226.7	185.5	242.9
300	89.6	117.3	102.4	134.0	115.1	150.8	127.9	167.5	140.7	184.3	153.5	201.1	166.3	217.8	179.1	234.6	191.9	251.3
310	92.5	121.2	105.8	138.5	119.0	155.8	132.2	173.1	145.4	190.4	158.7	207.8	171.9	225.1	185.1	242.4	198.3	259.7
320	95.5	125.1	109.2	143.0	122.8	160.8	136.5	178.7	150.1	196.6	163.8	214.5	177.4	232.3	191.1	250.2	204.7	268.1
330	98.5	129.0	112.6	147.4	126.7	165.9	140.7	184.3	154.8	202.7	168.9	221.2	183.0	239.6	197.0	258.0	211.1	276.4
340	101.5	132.9	116.0	151.9	130.5	170.9	145.0	189.9	159.5	208.9	174.0	227.9	188.5	246.9	203.0	265.8	217.5	284.8
350	104.5	136.8	119.4	156.4	134.3	175.9	149.3	195.5	164.2	215.0	179.1	234.6	194.1	254.1	209.0	273.7	223.9	293.2
360	107.5	140.7	122.8	160.8	138.2	180.9	153.5	201.1	168.9	221.2	184.2	241.3	199.6	261.4	214.9	281.5	230.3	301.6
370	110.5	144.6	126.2	165.3	142.0	186.0	157.8	206.6	173.6	227.3	189.4	248.0	205.1	268.6	220.9	289.3	236.7	310.0
380	113.4	148.6	129.6	169.8	145.9	191.0	162.1	212.2	178.3	233.4	194.5	254.7	210.7	275.9	226.9	297.1	243.1	318.3
390	116.4	152.5	133.0	174.2	149.7	196.0	166.3	217.8	183.0	239.6	199.6	261.4	216.2	283.2	232.9	304.9	249.5	326.7
400	119.4	156.4	136.5	178.7	153.5	201.1	170.6	223.4	187.7	245.7	204.7	268.1	221.8	290.4	238.8	312.8	255.9	335.1
410	122.4	160.3	139.9	183.2	157.4	206.1	174.9	229.0	192.3	251.9	209.8	274.8	227.3	297.7	244.8	320.6	262.3	343.5
420	125.4	164.2	143.3	187.7	161.2	211.1	179.1	234.6	197.0	258.0	215.0	281.5	232.9	304.9	250.8	328.4	268.7	351.9
430	128.4	168.1	146.7	192.1	165.1	216.1	183.4	240.1	201.7	264.2	220.1	288.2	238 4	312.2	256.7	336.2	275.1	360.2
440	131.4	172.0	150.1	196.6	168.9	221.2	187.7	245.7	206.5	270.3	225.2	294.9	243.9	319.5	262.7	344.0	281.5	368.6
450	134.3	175.9	153.5	201.1	172.7	226 2	191.9	251.3	211.1	276.5	230.3	301.6	249.5	326.7	268.7	351.8	287.9	377.0

NOTE:—Met.=Metallic. Com.=Common.

Production of Drawing Frame

1⅛-INCH FRONT ROLL

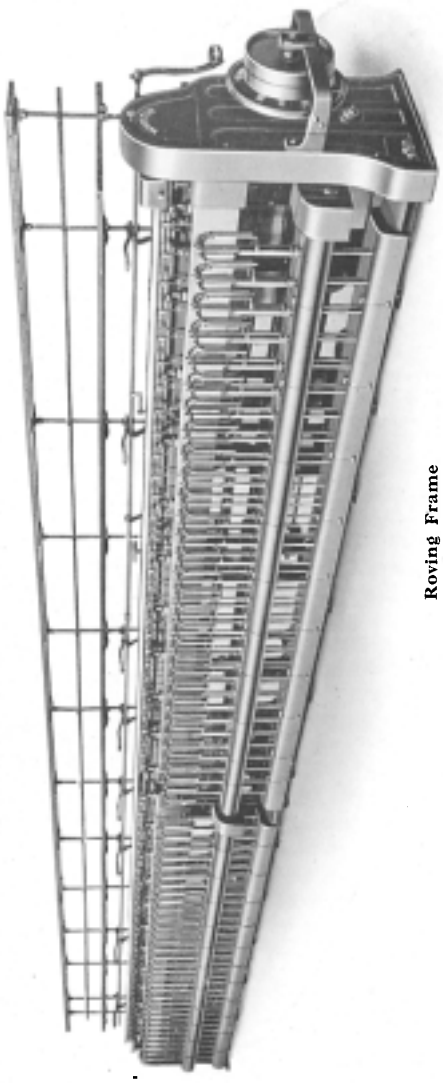
Table showing number pounds Drawing Sliver produced in one day of 10 hours, allowing 20 per cent for cleaning, oiling, etc.

Number of Grains in one Yard of Sliver

Rev. of Front Roll per Minute	35		40		45		50		55		60		65		70		75	
	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll
250	61.3	83.9	70.1	95.8	78.9	107.8	87.6	119.8	96.4	131.8	105.2	143.8	113.9	155.8	122.7	167.8	131.4	179.7
260	63.8	87.2	72.9	99.7	82.0	112.2	91.1	124.6	100.3	137.1	109.4	149.5	118.5	162.0	127.6	174.5	136.7	187.9
270	66.3	90.6	75.7	103.5	85.2	116.5	94.7	129.4	104.1	142.4	113.6	155.3	123.0	168.2	132.8	181.2	142.0	194.1
280	68.7	93.9	78.5	107.4	88.4	120.9	98.2	134.2	108.0	147.6	117.8	161.0	127.6	174.5	137.4	187.9	147.2	201.3
290	71.2	97.3	81.3	111.2	91.5	125.1	101.7	139.0	111.8	152.9	122.0	166.8	132.2	180.7	142.3	194.6	152.5	208.5
300	73.6	101.0	84.1	115.0	94.6	129.4	105.2	143.8	115.7	158.2	126.2	172.6	136.7	186.9	147.2	201.3	157.7	215.7
310	76.1	104.0	86.9	118.9	97.8	133.7	108.7	149.0	119.5	163.4	130.4	178.3	141.3	193.2	152.1	208.0	163.0	222.9
320	78.5	107.4	89.7	122.8	101.0	138.0	112.2	153.4	123.4	168.7	134.6	184.0	145.6	199.4	157.1	214.7	168.3	230.1
330	81.0	110.7	92.5	126.3	104.1	142.3	115.7	158.2	127.2	174.0	138.8	189.1	150.4	205.6	162.0	221.4	173.5	237.2
340	83.4	114.0	95.4	130.4	107.3	146.7	119.2	162.9	131.1	179.3	143.0	195.6	154.9	211.9	166.9	228.1	178.8	244.4
350	85.9	117.4	98.2	134.2	110.4	151.0	122.7	167.8	135.0	184.5	147.2	210.3	159.5	218.1	171.9	234.9	184.0	251.6
360	88.3	120.8	101.0	138.0	113.6	155.3	126.2	172.6	138.8	189.8	151.4	207.1	164.1	224.3	176.7	241.6	189.3	258.8
370	90.8	124.1	103.8	141.9	116.7	159.6	129.5	177.3	142.7	195.1	155.6	212.8	168.6	230.5	181.9	248.3	194.6	266.0
380	93.2	127.5	106.6	145.7	119.9	163.9	133.2	182.1	146.5	200.3	159.9	218.6	173.2	236.8	186.5	257.0	199.8	273.2
390	95.7	130.8	109.4	149.6	123.0	168.2	136.7	186.9	150.4	205.6	164.1	224.5	177.7	249.2	191.4	261.7	205.1	280.4
400	98.2	134.2	112.2	153.4	126.2	172.5	140.2	191.7	154.2	210.9	168.3	230.1	182.3	243.0	196.3	268.4	210.3	287.6
410	100.6	137.6	115.0	157.2	129.3	176.9	143.7	196.5	158.1	216.2	172.5	235.8	196.8	255.5	201.2	275.1	215.6	294.8
420	103.1	140.9	117.8	161.4	132.3	180.1	147.2	201.7	162.0	221.9	176.7	242.1	191.4	262.2	206.1	282.4	220.8	302.6
430	105.5	144.3	120.6	164.9	135.7	185.5	150.7	206.1	165.8	225.7	180.9	247.3	196.0	267.9	211.0	288.5	226.1	309.1
440	108.0	147.6	123.4	168.7	138.8	189.8	154.2	210.9	169.7	232.0	185.1	253.1	200.5	274.2	215.9	295.2	231.4	316.3
450	110.3	150.1	126.2	172.5	142.0	194.1	161.8	215.7	173.5	237.3	189.3	258.8	205.1	280.4	220.9	302.0	236.6	323.5

Note: — Met. = Metallic Com. = Common

COTTON ROVING

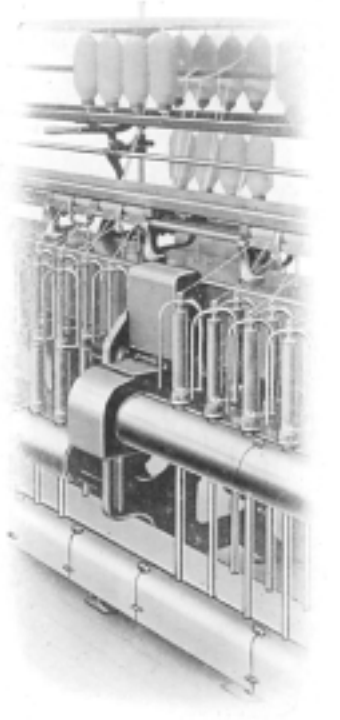


Roving Frame

COTTON ROVING MACHINERY

As successors to the **Providence Machine Company,** of Providence, R. I., builders of roving machinery since 1847, we take pleasure in presenting their complete line, as incorporated successfully in the Whitin organization for manufacturing textile machinery.

The Whitin-Providence Frame, perhaps, needs no introduction to the trade. Its long and continued use and popularity in hundreds of mills is a testimonial to the high reputation which it enjoys. With our excellent facilities, with the same men and most careful attention and specialization on our part, we expect to uphold the enviable reputation of this frame in the future. Its old friends, we hope to keep, and new ones to add.



Self-Balanced Rails

Our line of **Cotton Roving Machinery** includes Slubbers, Intermediates, Fine Roving and Jack Frames. These frames are built either direct-weighted or with our Patented Self-Balanced Rails In the weighted rail machine our method of balancing the bolster rail is by means of the customary direct weights, and insures an easy motion with a minimum amount of dwell at the change of traverse.

In comparison with the direct weighted style of rail, the **Patented Self-Balanced Rails** have many desirable features. The construction consists in dividing the bolster rail which carries the bobbins into two equal sections, the weight of one section counterbalancing the weight of the other, so that in the operation of the machine unequal balance is impossible, and no power is taken up in raising excess weight. In other words it is evident that in a direct-weighted machine the weights do not balance the frame at its heaviest load. Only when the machine is started with empty bobbins is the rail balanced. As the bobbins commence to fill, the machine becomes more and more out of balance, and, accordingly, when the bobbins are full the rail may be anywhere from one to two hundred pounds out of balance, according to the length of the frame and the size of the bobbins. On the self-balanced rail frame the rails, being balanced, remain so, as the bobbins are filled with cotton. The load on each rail increases in the same proportion, and therefore the rails maintain a constant balance. The many advantages of the self-balanced rail frame are apparent from a very casual examination of the operation of the machine. These are, briefly:

Saving in Repairs. The gearing is less liable to breakage, as the power is divided between the two sections, and each section has separate driving gears. Thus the gears have but one-half the work required of them in the older style of machine. Also, by the elimination of the weights, chains, studs, and pulleys necessary on direct-weighted machines, the frame is simplified, and, running in perfect balance, there is less strain on parts which are subject to wear. For this reason, too, the self-balanced rail frames maintain their alignment much longer and require re-levelling less frequently than those with weighted rails.

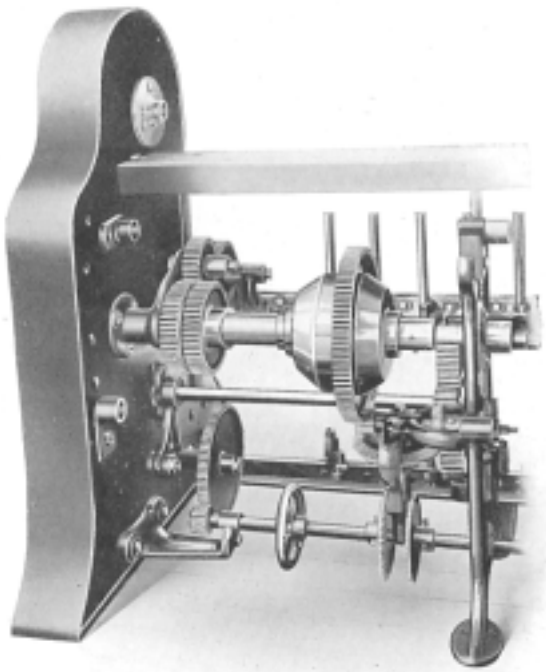
Elimination of Backlash. Owing to the peculiar construction of the self-balanced rails the dwell at the change of traverse is practically eliminated, the two rails being balanced, each by the other; and the direction of force being applied to the rails through the pinion gears, always tending to support the rails, there is no backlash, no matter how worn the shafts, boxes, or gears may become. The elimination of backlash causes the machine to build a more perfect nose or taper upon the bobbin and so produces a more even yarn, as it does away with the liability of strained or uneven roving, which comes from flushed-over or soft-nosed bobbins, all of which cause waste and bunches in the subsequent processes.

Accessibility of Parts and Cleanliness. By the elimination of the direct-weighting parts in the back, the machine is cleaner, and weighs from eight hundred to twelve hundred pounds less. The cleaning is more easily done as the underwork is more accessible, and the parts requiring oil are grouped at the head and centre, while on the direct-weighted type they extend the entire length of the back side of the machine.

Length of Frames. Owing to the reduced strain on the working parts, the self-balanced rail roving frame can be made much longer than one with the weighted rail. On very fine hanks this is a decided advantage, for, with the creeling and doffing operations at a minimum, a proportionately increased number of spindles per tender may be made profitable both to the operative and to the mill. On twelve hank or finer it should be possible with longer frames to pay better wages, reduce speed for better work, concede a slight loss in production per spindle due to the increased number of spindles stopped with the frame, and still show a substantial saving in labor cost per pound.

On both our direct-weighted and self-balanced rail frames, we would call attention to other special features of the construction, as follows:

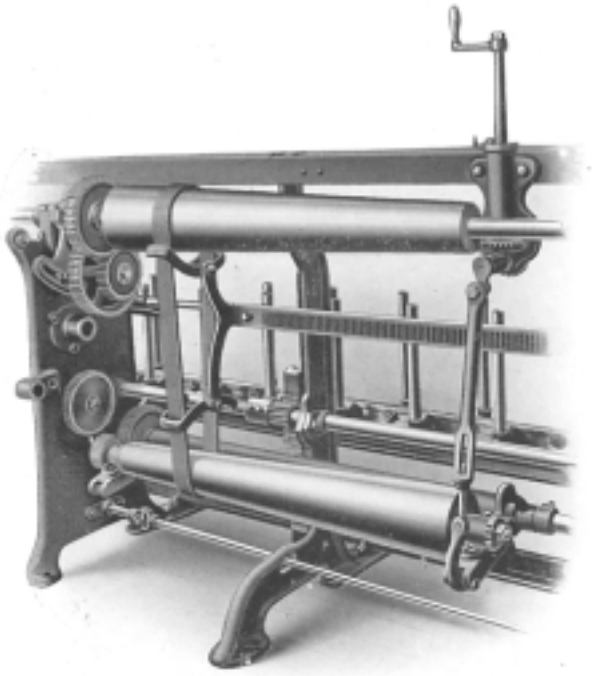
The Frames are built specially heavy. All parts which are fitted together are milled and machined on templates or jigs, so as to be interchangeable as regards repairs and securing an especially strong structure when fitted together.



DIFFERENTIAL MOTION

Differential Motion. The differential motion is the well-known Holdsworth type, which, of all the many motions on the market, has best survived the hard service of the cotton mills. It is simple and effective, and always runs in perfect balance. Its reliability has been well proven by over forty years of continuous service.

Cones. The outlines of the cones are determined by careful mathematical computations for all sizes of bobbins. The bottom cone is held in a swinging frame, maintaining an even tension on the belt.

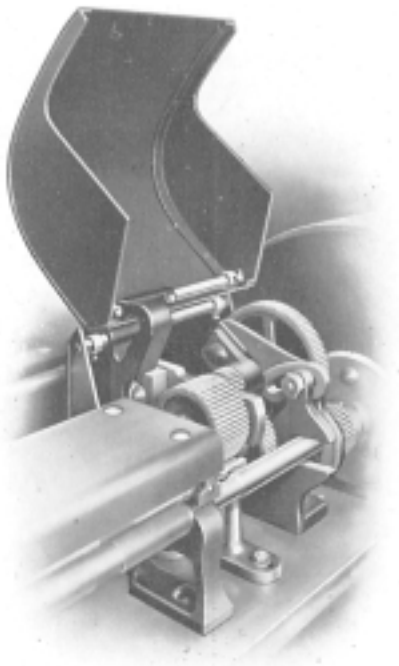


Cone Belt Motion

This regulating device, as well as the means for winding back the cone belt when the bobbins are full, is readily operated from the front of the frame. The construction of the cone on its shaft is particularly substantial, and slippage is absolutely prevented by the pins and keys. It is always possible to remove the top cone and shaft from the frame quickly and readily, without dis-

turbing the other parts of the machine. The cone is also so positioned as to run perfectly true under all conditions of work.

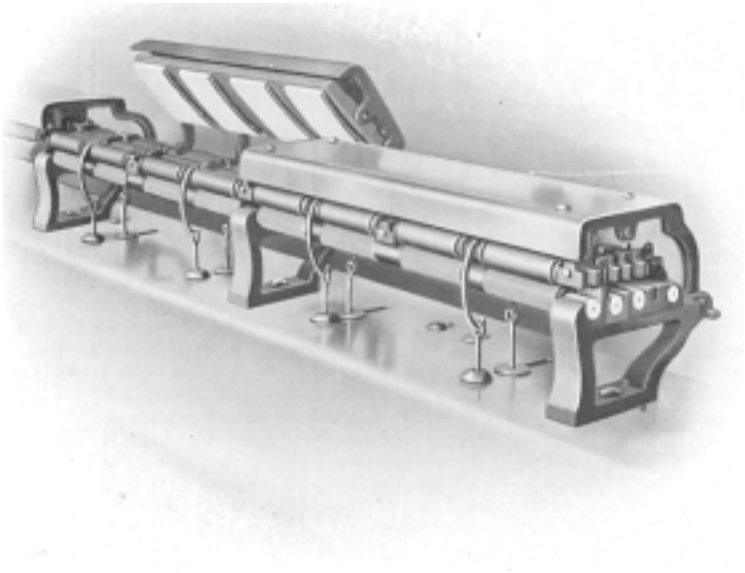
Draught and Lay Gearing. The draught and lay gearing are machine cut, and, while wide range of adjustment is secured, the weighting is arranged so that slight variations in the twist and lay can be secured by one tooth of the large change gear.



Draught Gearing

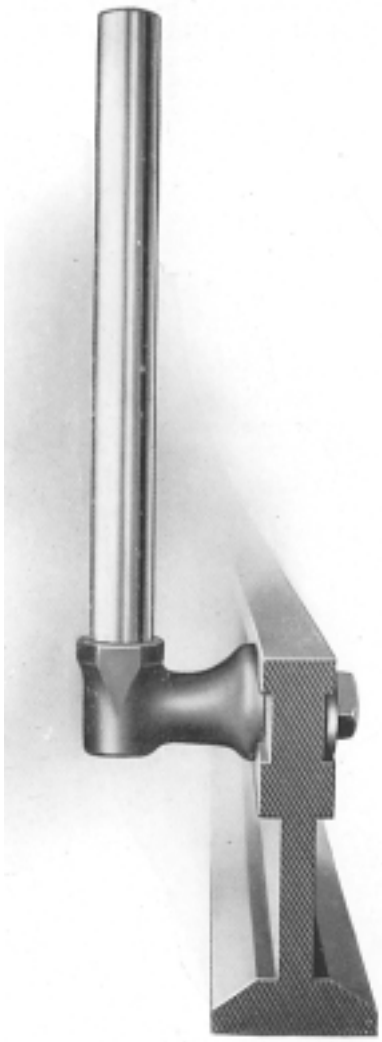
Roll-Stands. The steel roll-stands are easily adjustable to the longest or shortest staple, and the top-roll clearer is so designed that it will fit any spread of the rolls.

Bottom Drawing Rolls. The bottom drawing rolls are made of the best roller steel, and are irregularly fluted to avoid cutting the covering of the top-rolls.



Rolls and Clearer

Top-Rolls. The top-rolls are leather covered, of the solid common shell, or Jackson shell types. For special purposes we can furnish self-weighted top-rolls. Metallic interlocking rolls may be furnished if desired.



Roving Bolster

Spindles. The spindles furnished are made from crucible steel, accurately ground to size and thoroughly tested, so as to insure perfect running without vibration. The step of the spindle is provided with a reservoir of oil, thereby ensuring constant and thorough lubrication, giving long life to the spindles. As it is only necessary to occasionally add a little oil to the reservoir, it is obvious that there is a material saving in the amount of attendance and oil used.

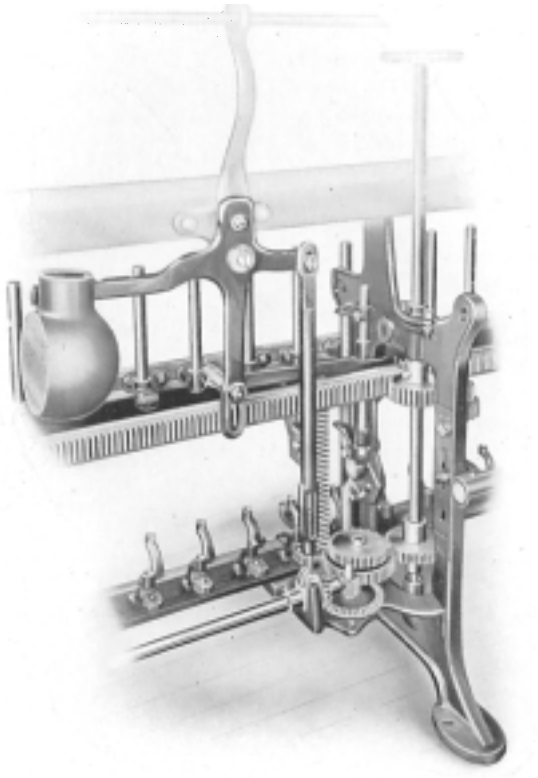
The Bolsters are of the rigid type, interlocked on the bolster rail and designed to withstand high speeds. They are so firmly fastened to the rail that there is but the remotest possibility for them to get out of plumb.

Flyers. The flyers are of the well-known solid nib type, and are made by special processes, with the best quality steel. They are evenly balanced at high speeds, are light in weight, and run free from vibration with their supporting spindles. By making and furnishing these flyers from our own works,

Flyer

we are always able to meet quick deliveries on odd sizes and special requirements, which are sometimes demanded by the mills.

The Rail Casings and Clearer Covers, of stiff, cold-rolled steel, highly polished, give a superior finish to the machine, and



Stop-Motion

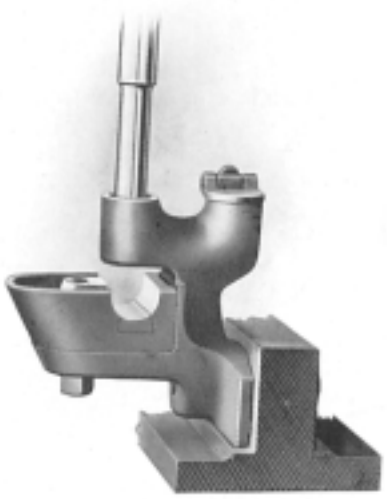
being unbreakable, no outlay for repairs is required. Accumulations of lint about the hubs of the bobbin gears are effectually prevented by our improved steel construction of the top casing plates of the bolster rails.

A Full-Bobbin Stop-Motion is applied. It can be set to knock off at any diameter of bobbin, and, when knocked off, the frames cannot be re-started without winding back the cone belt.

A **Safety Stop-Motion** is also applied, which prevents breakage to the machine in case the reverse motion fails to work properly.

Creels for any size bobbin are made of wood, with porcelain steps arranged for single or double roving.

A Hank Clock for registering the number of hanks delivered is applied at the foot end of each frame. It is driven by a worm on the end of the front roll, and protected by a cover, so that it cannot be tampered with by operatives.



Spindle-Step Oiler

The Driving Pulleys are 16 inches in diameter by $1\frac{5}{8}$ inches, 2 inches, $2\frac{1}{4}$ inches, or $2\frac{1}{2}$ inches, face. The loose pulley runs on a sleeve, which is integral with the yoke box supporting the driving shaft. When the belt is on the tight pulley, the loose pulley does not revolve, thus reducing the wear of pulley bearing. Liability of an accident to an operative while changing the gearing, through the unexpected starting of the frame, is avoided by the use of a locking device applied to the belt shipper rod.

Cone Belts: $1\frac{7}{8}$ inches wide.

Slubber,	11-inch	and	12-inch	traverse,	5	feet,	6	inches	long
Intermediate,	9	"	"	10	"	"	4	"	10	"	"
"				8	"	"	4	"	8	"	"
Roving,				7	"	"	4	"	6	"	"
Jack,				6	"	"	4	"	6	"	"
"				5	"	"	4	"	6	"	"

Weight of frames per foot in length:

	Weighted Rail	Self-Balanced Rails
Shipping weight	315 pounds.	290 pounds.
Net weight	280 pounds.	255 pounds.

Car Load: Three frames, boxed.

On the following pages dimension tables of our standard fly frames are given. The space between spindles is not confined to that given in the tables; for instance, the roving frames, 7-inch traverse, $5\frac{1}{4}$-inch space, may be made 5-inch or $5\frac{1}{2}$-inch space, thereby shortening or lengthening the frame, as may be desired. Any size frame may be shortened or lengthened in that way, provided there is sufficient space for the flyers to run without interfering with each other. On all frames where there are four or eight spindles to a roll, rolls of half lengths, and when there are six spindles to a roll, one or two rolls of two-thirds length, may be put in, to obtain a particular number of spindles or to make the length of the frame correspond with the space it is to occupy.

The Lengths of Frames tabulated in the tables are based on the following rule:

"To ascertain the length over all of our weighted-rail fly frame, multiply one-half the number of spindles by the space required, and to the product add 38 inches. Our self-balanced rail fly frame is $16\frac{3}{4}$ inches longer than the weighted-rail frame."

SPECIFICATIONS FOR ROVING MACHINERY

How many Machines?
What Process?
How many Spindles each?
Size of Bobbin?
What Space between Spindles?
Are Spindles to be our regular size? (See Note Below)
Are Bobbin Gear Collars to be our regular size? (See Note Below)
How many Right Hand?
How many Left Hand?
Hank Roving to be made?
Draft?
How many teeth in Draft Gears?
Diameter of Front Steel Roll?
What kind of Front Top-Rolls?
Twist per inch?
How many teeth in Twist Gears?
How many teeth in Traverse Gears?
How many teeth in Tension Gears?
Creel for what size Bobbin?
Size of Pulleys? Diameter and width of Face?
Belt from Above or Below?
Self Balanced Rails?
Length of Cotton to be used?
Are Front Steel Rolls to be case-hardened?
Are Self Oiling Steps to be furnished?

NOTE:—If these machines are **Not** to match machines built by the Whitin Machine Works or the Providence Machine Co., and are to match machines built by some other machinery builder, please send us sample Spindle, Bolster, Bobbin Gear and Bobbin.

We allow three change gears each for Draft, Twist, Tension and Traverse, also 5% spare Top-Rolls.

Machines will be painted **Black** unless otherwise specified.

EXTRAS

Slubbers:

Ball-bearing Top-Rolls, 3 lines.
Metallic Rolls, 3 lines.
Self-weighted Middle and Back Top-Rolls.
Case Hardened Front Bottom Rolls.
Self-Oiling Steps.

Intermediates:

Ball-bearing Top-Rolls, 3 lines.
Self-weighted Middle and Back Top-Rolls.
Case-hardened Front Bottom Rolls.
Self-Oiling Steps.

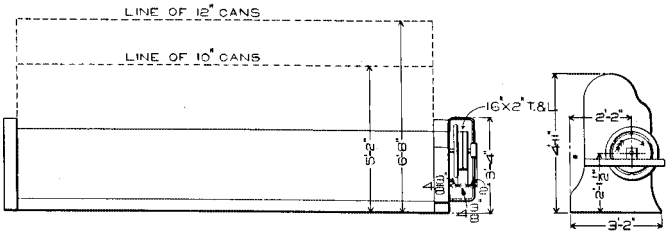
Roving Frames:

Ball-bearing Top-Rolls, 3 lines.
Self-weighted Middle and Back Top-Rolls.
Case-hardened Front Bottom Rolls.
Self-Oiling Steps.

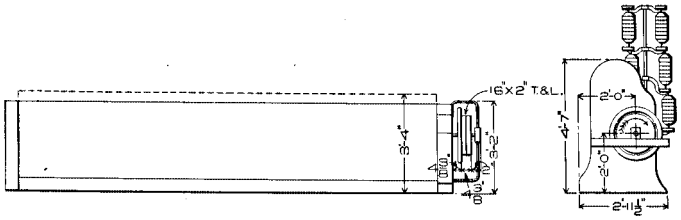
Cones with Cork Inserts.

NOTE:—**Roving Machinery** is furnished: 4 Spindles to a roll on 12 x 6″, 11 x 5½″, 10 x 5″ and 9 x 4½″ **Slubbers**; 6 Spindles to a roll on 10 x 5″, 9 x 4½″ and 8 x 4″ **Intermediates**; 8 Spindles to a roll on 8 x 3½″ and 7 x 3½″ Frames and narrower gauges.

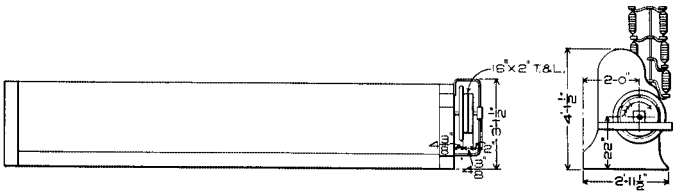
FLOOR PLANS OF WHITIN FLY FRAMES



SLUBBER.



INTERMEDIATE FRAME.



JACK OR ROVING FRAME.

Floor Spaces of Slubbing Frames

DIMENSIONS ARE OVER ALL

Full bobbin	12 in. by 6 in.				11 in. by 5½ in.				10 in. by 5 in.				9 in. by 4½ in.			
Space	10 in.				9½ in.				9 in.				8½ in.			
Gauge	4 Spindles to 20 in. Roll				4 Spindles to 19 in. Roll				4 Spindles to 18 in. Roll				4 Spindles to 17 in. Roll			
Rail	Weighted		Self-balanced		Weighted		Self-balanced		Weighted		Self-balanced		Weighted		Self-balanced	
Number of Spindles	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
40	19	11														
44	21	7			20	8										
48	23	3			22	3			21	3						
52	24	11	26	3	23	10	25	2	22	9			21	8		
56	26	7	27	11	25	5	26	9	24	3	25	7	23	1		
60	28	3	29	7	27	0	28	4	25	9	27	1	24	6	25	10
64	29	11	31	3	28	7	29	11	27	3	28	7	25	11	27	3
68	31	7	32	11	30	2	31	6	29	9	30	1	27	4	28	8
72	33	3	34	7	31	9	33	1	30	3	31	7	28	9	30	1
76	34	11	36	3	33	4	34	8	31	9	33	1	30	2	31	6
80					34	11	36	3	33	3	34	7	31	7	32	11
84					36	6	37	10	34	9	36	1	33	0	34	4
88									36	3	37	7	34	5	35	9
92									37	9	39	1	35	10	37	2
96													37	3	38	7
Widths	3 ft. 4 in.				3 ft. 4 in.				3 ft. 4 in.				3 ft. 4 in.			

NOTE. — Above lengths are for 2 in. face pulleys; for 2½ in. face add 1 in.

Floor Spaces of Intermediate Frames. (Dimensions are over all)

Full bobbin	10 in. by 5 in.				9 in. by 4½ in.				8 in. by 4 in.				8 in. by 3¾ in.			
Space	7½ in.				7 in.				6 in.				5½ in.			
Gauge	6 spindles to 22½ in. roll				6 spindles to 21 in. roll				6 spindles to 18 in. roll				8 spindles to 22 in. roll			
Rail	Weighted		Self-balanced		Weighted		Self-balanced		Weighted		Self-balanced		Weighted		Self-balanced	
Number of Spindles	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
60	22	0														
66	23	11			22	6										
72	25	9	27	1	24	3	25	7								
78	27	8	29	0	26	0	27	4	22	9						
84	29	6	30	10	27	9	29	1	24	3	25	7				
88													23	5		
90	31	5	32	9	29	6	30	10	25	9	27	1				
96	33	3	34	7	31	3	32	7	27	3	28	7	25	3	26	7
100	34	6	35	10												
102					33	0	34	4	28	9	30	1				
104	35	9	37	1									27	1	28	5
108	37	0	38	4	34	9	36	1	30	3	31	7				
112	38	3	39	7									28	11	30	3
114					36	6	37	10	31	9	33	1				
116	39	6	40	10												
120	40	9	42	1	38	3	39	7	33	3	34	7	30	9	32	1
126					40	0	41	4	34	9	36	1				
128													32	7	33	10
132									36	3	37	7				
136													34	5	35	9
138									37	9	39	1				
144									39	3	40	7	36	3	37	7
150									40	9	42	1				
152													38	1	39	5
156													39	0	40	4
160													39	11	41	3
168													41	9	43	1
Widths		3 Ft.	4 in.			3 Ft.	4 in.			3 ft.	4 in.			3 ft.	1½ in.	

NOTE. — Above lengths are for 2-in. face pulleys; for 2½-in. face add 1 in.

Floor Spaces of Fine Roving Frames

DIMENSIONS ARE OVER ALL

Full Bobbin	7 in. by 3½ in.				7 in. by 3 in.				6 in. by 3 in.			
Space	5¼ in.				4½ in.				4½ in.			
Gauge	8 Spindles to 21 in. Roll				8 Spindles to 18 in. Roll				8 Spindles to 18 in. Roll			
Rail	Weighted		Self-Balanced		Weighted		Self-Balanced		Weighted		Self-Balanced	
Number of Spindles	Feet	Inches	Feet	Inches	Feet	Inches	Feet	Inches	Feet	Inches	Feet	Inches
96	24	3										
104	26	0			22	9			22	9		
112	27	9	29	1	24	3			24	3		
120	29	6	30	10	25	9	27	1	25	9	27	1
128	31	3	32	7	27	3	28	7	27	3	28	7
136	33	0	34	4	28	9	30	1	28	9	30	1
144	34	9	36	1	30	3	31	7	30	3	31	7
152	36	6	37	10	31	9	33	1	31	9	33	0
160	38	3	39	7	33	3	34	7	33	3	34	7
168	40	0	41	4	34	9	36	1	34	9	36	1
176	41	9	43	1	36	3	37	7	36	3	37	7
184	43	6	44	10	37	9	39	1	37	9	39	1
192	45	3	46	7	39	3	40	7	39	3	40	7
200					40	9	42	1	40	9	42	1
208									42	3	43	7
Widths	3 ft., 1½ in.				3 ft., 1½ in.				3 ft., 1½ in.			

NOTE: — Above lengths are for 2 in. face pulleys; for 2½ in. face add 1 in.

Floor Spaces of Jack Frames

DIMENSIONS ARE OVER ALL

Full Bobbin	6 in. by 2½ in.				5 in. by 2½ in.				4½ in. by 2¼ in.			
Space	4¼ in.				4¼ in.				4 in.			
Gauge	8 Spindles to 17 in. Roll				8 Spindles to 17 in. Roll				8 Spindles to 16 in. Roll			
Rail	Weighted		Self-Balanced		Weighted		Self-Balanced		Weighted		Self-Balanced	
Number of Spindles	Feet	Inches	Feet	Inches	Feet	Inches	Feet	Inches	Feet	Inches	Feet	Inches
120	24	6										
128	25	11										
136	27	4	28	8								
144	28	9	30	1	28	9	30	1	27	3	28	7
152	30	2	31	6	30	2	31	6	28	7	29	11
160	31	7	32	11	31	7	32	11	29	11	31	3
168	33	0	34	4	33	0	34	4	31	3	32	7
176	34	5	35	9	34	5	35	9	32	7	33	11
184	35	10	37	2	35	10	37	2	33	11	35	3
192	37	3	38	7	37	3	38	7	35	3	36	7
200	38	8	40	0	38	8	40	0	36	7	37	11
208	40	1	41	5	40	1	41	5	37	11	39	3
216	41	6	42	10	41	6	42	10	39	3	40	7
224									40	7	41	11
Widths	3 ft., 1½ in.				3 ft., 1½ in.				3 ft., 1½ in.			

NOTE: — Above lengths are for 2 in. face pulleys; for 2½ in. face add 1 in.

PRODUCTION OF FLY FRAMES

On the following pages will be found tables of production which we consider reasonable under average conditions of work. These tables are purposely made conservative but in many mills greater results are being obtained.

In these tables the twist per inch, viz., 1.20 times the square root of the hank roving, is that usually given to cotton of $1\frac{1}{8}''$ length of staple, but when Sea Island, or other long staple cotton, is used, less twist will be required, and the production will be increased.

The tables are calculated for ten hours per day running time, and fifteen minutes are allowed for one tender for doffing each set.

The weight of cotton on full bobbins will vary with different kinds of cotton; that given in the tables is about the average of ordinary cotton.

Slubbers

PRODUCTION PER DAY OF TEN HOURS

Full Bobbin	12 in. by 6 in.				11 in. by 5½ in.				10 in. by 5 in.				9 in. by 4½ in.			
Cotton on Full Bobbin	44 ounces				32 ounces				24 ounces				18 ounces			
Flyer Revolu.	650 per Minute				700 per Minute				750 per Minute				800 per Minute			
Pulley Revolu.	320 per Minute				344 per Minute				368 per Minute				314 per Minute			
Front Roll Diam.	1¼ in.				1¼ in.				1¼ in.				1¼ in.			
Hank Roving	Twist per inch	R.P.M. F. Roll	Sets per day	Hanks per day	Pounds per day	R.P.M. F. Roll	Sets per day	Hanks per day	Pounds per day	R.P.M. F. Roll	Sets per day	Hanks per day	Pounds per day	R.P.M. F. Roll	Sets per day	Hanks per day	Pounds per day
.20	.54	306	20.82	11.45	57.25												
.25	.60	276	17.54	12.06	48.23												
.30	.66	251	14.87	12.27	40.89	270	18.68	11.21	37.36								
.35	.71	233	12.81	12.31	35.21	251	16.43	11.50	32.86								
.40	.76	218	11.12	12.23	30.58	234	14.53	11.62	29.06	251	17.96	10.78	26.94				
.45	.80	207	9.83	12.16	27.03	223	13.02	11.72	26.04	239	16.32	11.02	24.48				
.50	.84	197	8.73	12.00	24.00	212	11.70	11.70	23.40	227	14.85	11.14	22.27	243	18.26	10.27	20.54
.55	.89	186	7.72	11.68	21.23	200	10.46	11.51	20.92	214	13.44	11.09	20.16	229	16.74	10.35	18.83
.60	.92	177	7.00	11.55	19.25	194	9.57	11.48	19.14	208	12.40	11.16	18.60	222	15.63	10.54	17.58
.65	.97	170	6.27	11.21	17.24	184	8.63	11.22	17.26	197	11.30	11.02	16.95	210	14.35	10.49	16.14
.70	1.00	165	5.74	11.05	15.78	178	7.95	11.13	15.90	191	10.46	10.98	15.69	204	13.40	10.55	15.08
.75	1.04	160	5.23	10.78	14.38	171	7.28	10.92	14.56	184	9.65	10.86	14.48	196	12.46	10.51	14.02
.80	1.07	154	4.82	10.55	13.19	166	6.74	10.78	13.48	178	8.98	10.78	13.47	190	11.67	10.50	13.13
.85	1.11	150	4.42	10.33	12.15	160	6.21	10.56	12.42	172	8.32	10.61	12.48	183	10.88	10.40	12.24
.90	1.14	145	4.10	10.14	11.27	156	5.79	10.42	11.58	168	7.78	10.50	11.67	179	10.24	10.37	11.52
.95	1.17	141	3.81	9.96	10.48	152	5.40	10.26	10.80	163	7.30	10.40	10.95	174	9.63	10.29	10.83
1.00	1.20	138	3.56	9.79	9.79	148	5.07	10.14	10.14	159	6.85	10.27	10.27	170	9.09	10.23	10.23
1.05	1.23					145	4.74	9.95	9.48	155	6.45	10.15	9.67	166	8.59	10.14	9.66
1.10	1.26					141	4.46	9.81	8.92	152	6.07	10.01	9.10	162	8.12	10.05	9.14
1.15	1.29					138	4.19	9.65	8.39	148	5.74	9.90	8.61	159	7.69	9.95	8.65
1.20	1.31					136	3.98	9.56	7.97	146	5.45	9.80	8.17	156	7.34	9.91	8.26
1.25	1.34									143	5.18	9.71	7.77	153	6.94	9.76	7.81
1.30	1.37									140	4.67	9.10	7.00	149	6.54	9.57	7.36

Intermediate Frames — PRODUCTION PER DAY OF TEN HOURS

Full Bobbin		10 in. by 5 in.				9 in. by 4½ in.				8 in. by 4 in.				8 in. by 3½ in.			
Cotton on Full Bobbin		24 ounces				18 ounces				14 ounces				12 ounces			
Flyer Revolu.		850 per Minute				950 per Minute				1050 per Minute				1100 per Minute			
Pulley Revolu.		418 per Minute				374 per Minute				359 per Minute.				376 per Minute			
Front Roll Diam.		1¼ in.				1¼ in.				1⅛ in.				1⅛ in.			
Hank Roving	Twist per inch	R.P.M. F. Roll	Sets per day	Hanks per day	Pounds per day	R P M. F. Roll	Sets per day	Hanks per day	Pounds per day	R.P.M. F. Roll	Sets per day	Hanks per day	Pounds per day	R P M F. Roll	Sets per day	Hanks per day	Pounds per day
.80	1.07	202	9.89	11.86	14.83												
.85	1.11	196	9.18	11.70	13.77												
.90	1.14	190	8.57	11.56	12.85	212	11.59	11.74	13.04								
.95	1.17	185	8.07	11.50	12.10	207	10.95	11.70	12.32								
1.00	1.20	180	7.59	11.38	11.38	202	10.35	11.64	11.64	247	13.26	11.60	11.60				
1.05	1.23	176	7.16	11.27	10.74	197	9.80	11.57	11.02	241	12.63	11.60	11.05				
1.10	1.26	172	6.72	11.08	10.08	192	9.27	11.47	10.43	236	11.99	11.54	10.49				
1.15	1.29	168	6.38	11.00	9.57	189	8.82	11.41	9.92	230	11.47	11.53	10.03				
1.20	1.31	165	6.07	10.93	9.11	185	8.42	11.36	9.47	227	11.00	11.54	9.62				
1.25	1.34	161	5.74	10.76	8.61	181	7.98	11.22	8.98	222	10.47	11.45	9.16				
1.30	1.37	158	5.46	10.64	8.19	177	7.62	11.14	8.57	217	10.02	11.40	8.77				
1.35	1.39	154	5.20	10.53	7.80	174	7.30	11.08	8.21	214	9.62	11.36	8.42				
1.40	1.42	150	4.95	10.39	7.42	170	6.95	10.94	7.82	209	9.21	11.28	8.06				
1.50	1.47	147	4.53	10.18	6.79	165	6.40	10.80	7.20	202	8.51	11.16	7.44				
1.60	1.52	142	4.14	9.94	6.21	159	5.88	10.59	6.62	196	7.87	11.02	6.89				
1.75	1.59	136	3.67	9.62	5.50	152	5.24	10.31	5.89	188	7.10	10.87	6.21				
2.00	1.69	128	3.07	9.20	4.60	142	4.39	9.88	4.94	176	5.99	10.48	5.24	184	7.08	10.62	5.31
2.25	1.80					134	3.75	9.50	4.22	165	5.12	10.08	4.48	173	6.10	10.30	4.58
2.50	1.90					127	3.24	9.13	3.65	156	4.45	9.72	3.89	164	5.32	9.98	3.99
2.75	1.99									149	3.92	9.43	3.43	156	4.68	9.65	3.51
3.00	2.07									143	3.49	9.15	3.05	150	4.19	9.42	3.14
3.50	2.24									133	2.82	8.65	2.47	139	3.40	8.92	2.55
4.00	2.40													130	2.82	8.48	2.12
4.50	2.54													123	2.35	7.92	1.76
5.00	2.67													117	2.07	7.75	1.55

Roving Frames

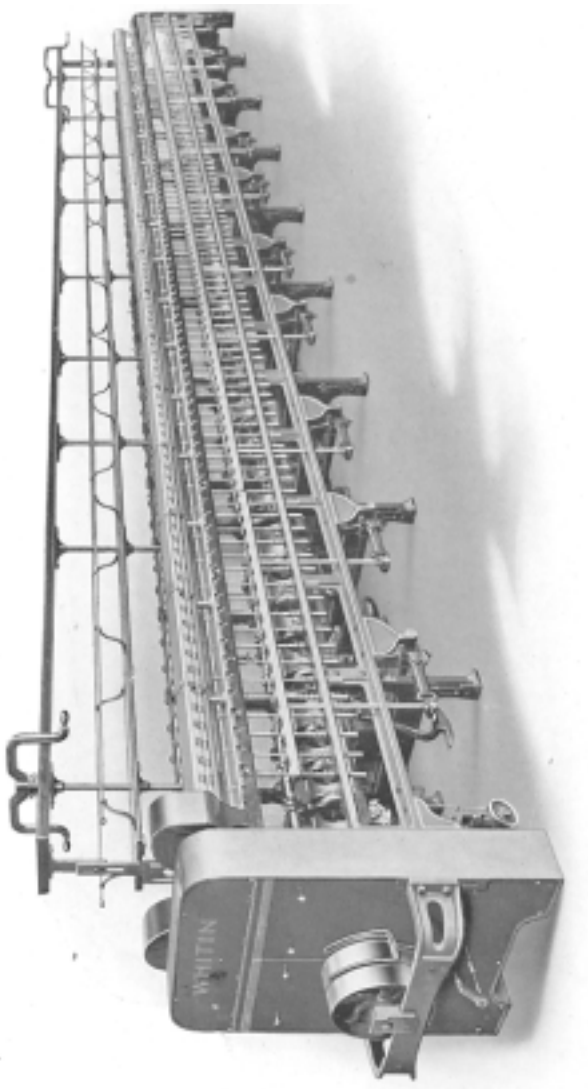
PRODUCTION PER DAY OF TEN HOURS

Full Bobbin		7 in. by 3½ in.				7 in. by 3 in.				6 in. by 3 in.			
Cotton on Full Bobbin		10 ounces				8½ ounces				7 ounces			
Flyer Revolutions		1150 per minute				1200 per minute				1250 per minute			
Pulley Revolutions		367 per minute				383 per minute				399 per minute			
Front Roll diameter		1⅛ inch				1⅛ inch				1⅛ inch			
Hank Roving	Twist per inch	R.P.M. F. Roll	Sets per day	Hanks per day	Pounds per day	R.P.M. F. Roll	Sets per day	Hanks per day	Pounds per day	R.P.M. F. Roll	Sets per day	Hanks per day	Pounds per day
2.00	1.69	193	8.51	10.65	5.32								
2.50	1.90	171	6.44	10.06	4.02								
3.00	2.07	157	5.12	9.60	3.20	164	6.12	9.75	3.25				
3.25	2.16	151	4.60	9.33	2.87	156	5.51	9.52	2.93				
3.50	2.24	145	4.17	9.14	2.61	152	5.00	9.31	2.66				
3.75	2.32	140	3.80	8.89	2.37	146	4.57	9.11	2.43				
4.00	2.40	136	3.48	8.72	2.18	141	4.19	8.92	2.23	147	5.14	9.00	2.25
4.25	2.47	132	3.20	8.50	2.00	137	3.86	8.76	2.05	143	4.76	8.88	2.09
4.50	2.54	128	2.96	8.33	1.85	134	3.68	8.57	1.91	139	4.42	8.73	1.94
4.75	2.60	125	2.75	8.17	1.72	131	3.33	8.41	1.77	136	4.12	8.55	1.80
5.00	2.67	122	2.56	8.00	1.60	127	3.10	8.20	1.64	132	3.82	8.40	1.68
5.25	2.75	119	2.38	7.82	1.49	123	2.88	8.03	1.53	129	3.58	8.19	1.56
5.50	2.80	116	2.24	7.70	1.40	121	2.72	7.93	1.45	126	3.37	8.14	1.48
5.75	2.88	113	2.09	7.53	1.31	118	2.54	7.76	1.35	224	3.15	7.93	1.38
6.00	2.92	111	1.97	7.38	1.23	116	2.41	7.68	1.28	121	2.99	7.86	1.31
6.50	3.06	106	1.76	7.15	1.10	111	2.14	7.41	1.14	116	2.67	7.60	1.17
7.00	3.17	103	1.58	6.93	.99	107	1.93	7.21	1.03	111	2.39	7.35	1.05
7.50	3.29	99	1.43	6.68	.89	103	1.74	6.98	.93	107	2.17	7.13	.95
8.00	3.40	96	1.30	6.48	.81	100	1.58	6.72	.84	104	1.98	6.96	.87
9 00	3.60					94	1.34	6.39	.71	98	1.67	6.57	.73
10.00	3.79					90	1.15	6.11	.61	93	1.44	6.30	.63
11.00	3.97									89	1.26	6.05	.55
12.00	4.16									85	1.14	6.00	.50
13.00	4.33									82	.98	5.59	.43
14.00	4.49									79	.88	5.39	.39

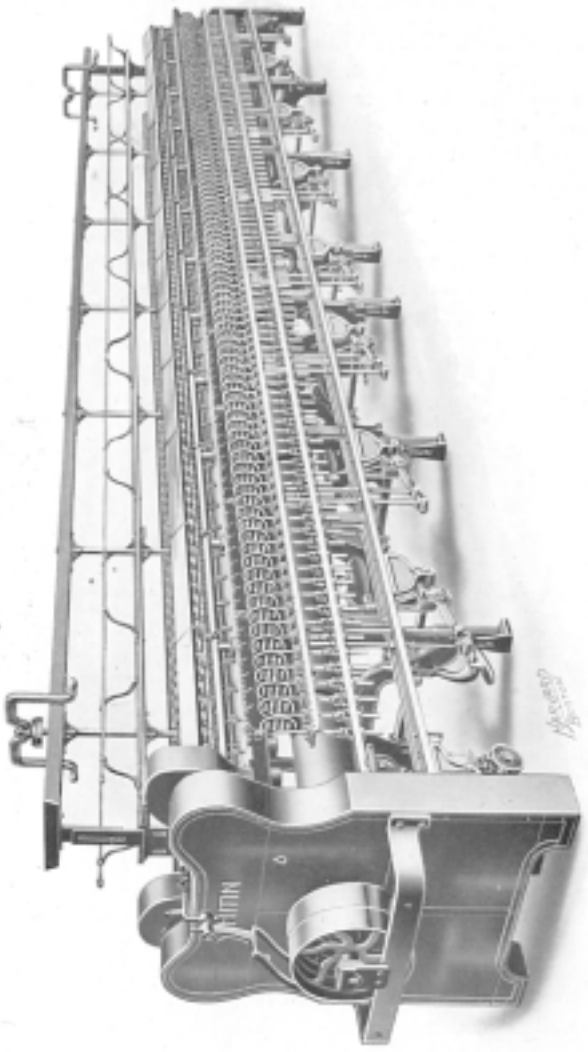
Jack Frames—Production Per Day of Ten Hours

Full Bobbin		6 in. by 2½ in.				5 in. by 2½ in.				4½ in. by 2¼ in.			
Cotton on Full Bobbin		5½ ounces				4 ounces				3 ounces			
Flyer Revolutions		1350 per minute				1500 per minute				1600 per minute			
Pulley Revolutions		431 per minute				479 per minute				510 per minute			
Front Roll diameter		1⅛ inch				1⅛ inch				1⅛ inch			
Hank Roving	Twist per inch	R.P.M. F. Roll	Sets per day	Hanks per day	Pounds per day	R.P.M. F. Roll	Sets per day	Hanks per day	Pounds per day	R.P.M. F. Roll	Sets per day	Hanks per day	Pounds per day
5.00	2.67	143	5.09	8.75	1.75								
5.50	2.81	138	4.49	8.52	1.55								
6.00	2.92	131	4.01	8.28	1.38								
6.50	3.06	126	3.57	7.99	1.23								
7.00	3.18	120	3.22	7.77	1.11								
7.50	3.29	116	2.93	7.50	1.00								
8.00	3.40	112	2.67	7.36	.92								
8.50	3.50	109	2.46	7.22	.85								
9.00	3.60	106	2.27	7.02	.78								
9.50	3.70	104	2.10	6.86	.72								
10.00	3.79	101	1.96	6.70	.67	112	2.91	7.30	.73				
10.50	3.89	99	1.82	6.62	.63	109	2.72	7.14	.68				
11.00	3.97	96	1.71	6.49	.59	105	2.55	7.00	.64				
12.00	4.15	92	1.51	6.24	.52	102	2.25	6.72	.56				
13.00	4.33	88	1.34	5.98	.46	98	2.01	6.50	.50				
14.00	4.49	85	1.20	5.74	.41	95	1.82	6.44	.46				
16.00	4.80	79	.99	5.44	.34	88	1.49	5.92	.37	94	2.08	6.24	.39
18.00	5.08	75	.83	5.13	.29	84	1.27	5.76	.32	89	1.77	5.94	.33
20.00	5.36	71	.71	4.80	.24	79	1.08	5.40	.27	84	1.51	5.60	.28
22.00	5.62	68	.62	4.62	.21	76	.95	5.28	.24	81	1.33	5.50	.25
24.00	5.87	65	.55	4.33	.18	72	.82	5.04	.21	77	1.17	5.28	.22
26.00	6.10					70	.74	4.78	.18	74	1.04	4.94	.19
28.00	6.33					67	.66	4.48	.16	72	.92	4.76	.17
30.00	6.56					65	.60	4.47	.15	68	.83	4.50	.15

SPINNING



Ring Spinning Frame, with Tape Driven Spindles



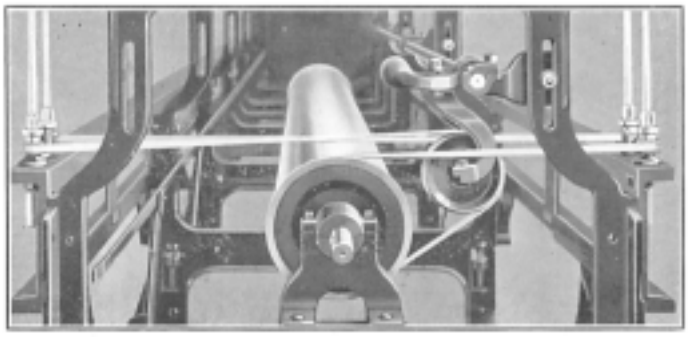
Ring Spinning Frame with Band Driven Spindles

THE WHITIN RING SPINNING FRAMES

For Cotton Warp, Filling and Hosiery Yarns

The Whitin Ring Spinning Frames command today, as they always have in the past, a leading position with regard to both design and construction. We build both the Band Drive and Tape Drive types of frames, and, as our organization keeps in constant touch with the mills, these frames embody all of the up-to-date improvements which appeal to modern cotton spinners.

We have met the growing demand for the **tape drive** of spindles by designing a new frame equipped with this style of driving, and are furnishing many large installations so arranged. The claims made for Tape Drive are: a uniformity in twist; a more even and constant banding pull assured; and there is a saving in the cost of banding.



Tape Drive

The most noticeable difference between this frame equipped with tape drive spindles and the frame with the band drive is the substitution of a flat whirl on the spindle and the use of a tape tension pulley, whereby four spindles are driven by one tape. The geared end of the tape drive frame has been designed to give a very solid and substantial appearance to the frame, and a shaft drive for the builder motion has been substituted for the old-style chain

drive. With the exception of these differences the following description is equally applicable to either the band driven or tape driven style frame.

The Framing is substantial, with extra wide roll beams and spindle bolster rails on the double web rail principle, with bridge connections between sampson supports. The foot end and sampsons are provided with loose feet for adjustment to suit uneven flooring.

The Head End is specially designed to facilitate the necessary twist gear changes. Cut gearing with wide faces is used. Convenience is provided for oiling, and all parts that are not readily accessible for oiling are provided with oil tubes, having their orifices placed in positions convenient to the operatives. The ends of the frame are enclosed by removable panels which form guards against accident.

The Fluted Rolls are made of the best roller steel, and are irregularly fluted to avoid liability of cutting the covering of the top-rolls. All rolls are fitted together and numbered in the shop, to insure proper running in the mill.

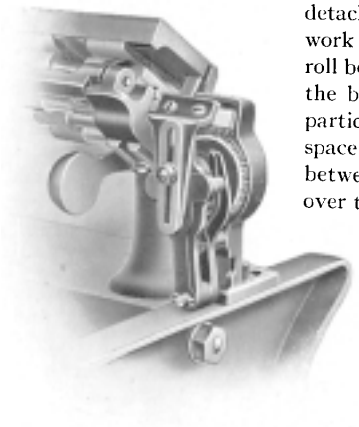
We are equipping most of the frames we now build with **Front Steel Rolls Case-Hardened** (at slight extra cost), and in a good many instances we case-harden all three lines. This hardened roll is beautifully finished, and is highly desirable because the flutes remain sharp for a much longer time than those of the ordinary crucible steel roll, as the outer casing of the roll is so hard, it is not so readily nicked by the spinners' hooks, and there is no wearing of the roll necks.

The Top-Rolls are usually furnished covered, either shell or solid, and weighted with any of the various saddles on the market, as desired by the purchaser. Self-weighted top-rolls are also furnished to the mills preferring this method of weighting.

Whitin Saddle

The Top-Roll Clearers may be either stationary or revolving style as preferred.

The Roll-Stands with their adjustable slides have milled bearings for steel rolls. The bearings are of such width as to insure long life to the neck of the rolls. The detachable cap-bars are arranged to work independently, the finger at each roll bearing being divided so that when the bar is thrown back, only its own particular set of rolls is affected. Ample space for oiling the roll bearings is left between the halves of cap-bar fingers over the roll bearings.



Roving Traverse

Our Patented Variable Roving Traverse-Motion is supplied. It is adjustable as to length of traverse, and has a variable motion, which prevents unequal wear of leather top-rolls.

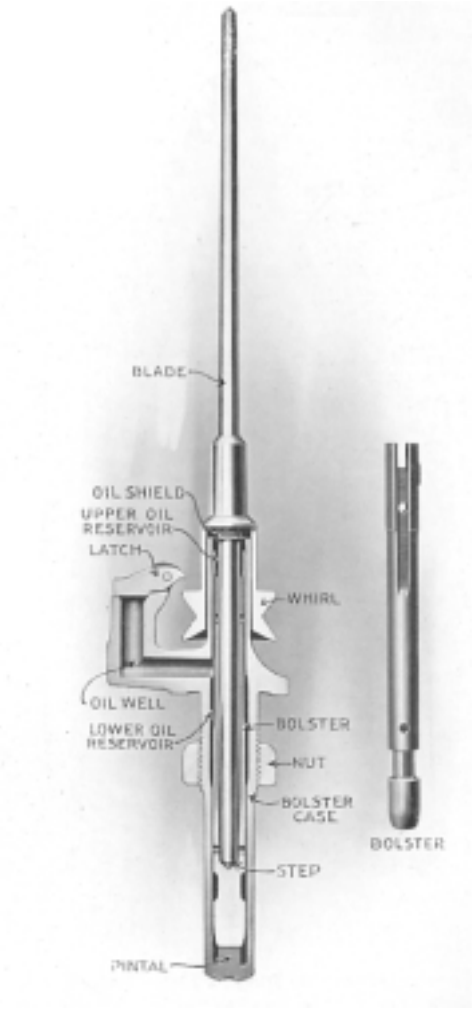
Our Frames are usually equipped, for either band or tape drive, with the patented **Whitin Improved Gravity Spindles.** In general construction the Whitin Improved Gravity Spindles are similar to the well-known Whitin Gravity Spindles, of which there are many millions now in use in this country. These new spindles as well as the old types are notable for simplicity of construction, steadiness in running, and durability. In addition they possess great advantages in consuming less power and the avoidance of throwing oil. They are made in three standard sizes, viz:

Standard Gravity
Medium Gravity
Large Gravity

All these spindles are of the same general construction, but vary as to sizes and diameters of whirls.

A very popular spindle is the Whitin Improved Gravity Spindle fitted with centrifugal clutch.

We are also prepared to make Draper No. 2, No. 4 and No. 5 types of spindle, and can furnish Rabbeth, Sherman or McMullen spindles when ordered.



Section of Whitin Improved Gravity Spindle

For spinning warp yarns, we recommend the Large Gravity Spindle for coarse yarns, from 4's to 12's, the Medium Gravity Spindle for all counts, from 12's to 24's, and the Standard Gravity Spindle on all finer counts.

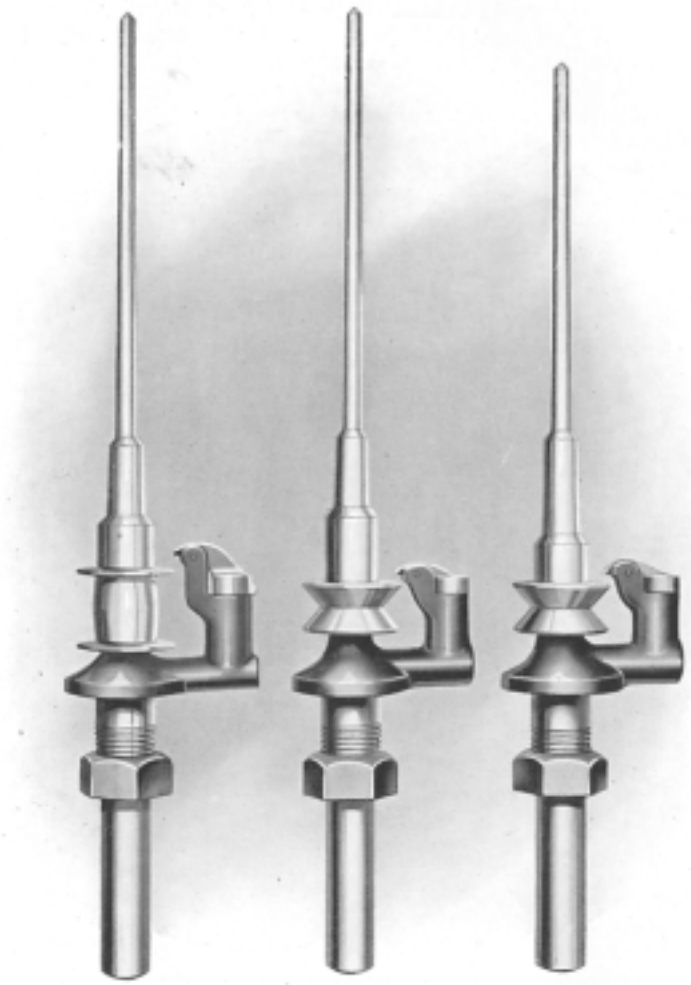
For spinning filling and hosiery yarns, we recommend the Medium Spindle on coarse counts to 20's, and the Standard Spindle on all finer counts.

We also recommend the use of large whirls on spindles, as this tends to give a regular speed, uniform twist, less breakage of bands, and a reduction in repairs in spindles and cylinders.

The following spindles are what might be called "Regular," as regards sizes of whirls:

Standard	No.	1,	diameter	of	whirl,	$\frac{3}{4}$	inch
"	"	2	"	"	"	$\frac{15}{16}$	"
Medium	"	1	"	"	"	$\frac{7}{8}$	"
"	"	2	"	"	"	1	"
Large			"	"	"	$1\frac{1}{8}$	"

Adjustable Ring in Plate Holder



Whitin Spindles

To suit special conditions the Standard Spindle may be fitted with $\frac{3}{4}$", $\frac{13}{16}$", $\frac{7}{8}$", $\frac{15}{16}$" or 1" diameter whirls; the Medium with $\frac{3}{4}$", $\frac{13}{16}$", $\frac{7}{8}$", $\frac{15}{16}$", 1", $1\frac{1}{16}$" or $1\frac{5}{16}$" diameter whirls, and the Large with $\frac{7}{8}$", $\frac{15}{16}$", 1", $1\frac{1}{8}$" or $1\frac{5}{16}$" diameter whirls; but as a general rule we would prefer not to fit any spindle with less than $\frac{7}{8}$" diameter whirl, with the possible exception of the Standard Spindle.

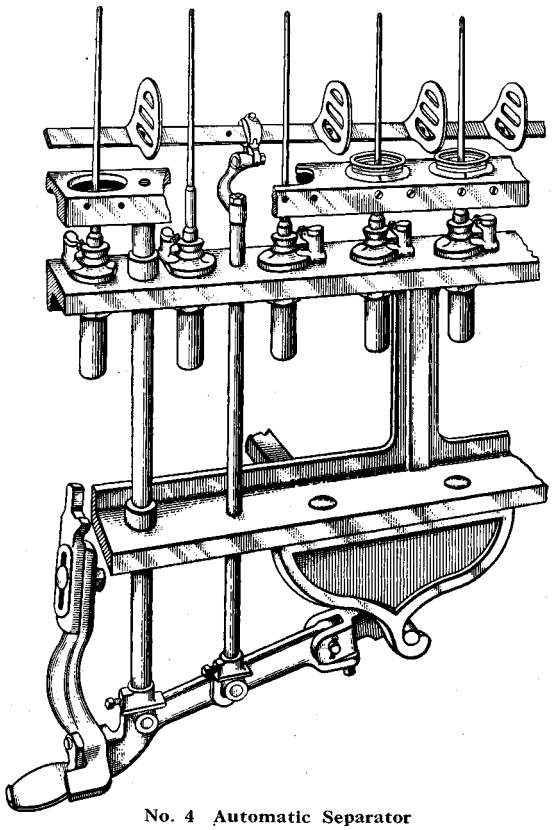
Rings of our own make are supplied unless otherwise ordered, cast-iron or plate ring holders as preferred. Efficient Traveller Cleaners can also be had if desired. The Ring-Rails of rugged construction, are made in short lengths, thus decreasing the liability of deflection. The rails are secured to milled heads of the lifting rods in such a manner as to prevent any undue vibration while working, and, at the same time, being easily removed when desired. The level of the rails is corrected by a novel construction of the lifting rod arms,as is best shown in the illustration of the separator motion.

Traveller Magazine

If desired, our frames may be equipped with the **Whitin Traveller Magazine**. This little device, as shown in the illustration, fills a long-felt want among ring spinners. The travellers are usually put in packages, in which they are found more or less entangled in chains or bunches, although this is more noticeable in the smaller sizes than in the larger, and is the cause of much waste. The use of the Whitin Traveller Magazine prevents this loss, a vibratory motion imparted to the magazine effectually disengaging the travellers, and delivers them, a few at a time, into the receiving cup, convenient to

the hand of the operative. The receptacle in the magazine is provided with an adjustable delivery to suit different sizes of travellers.

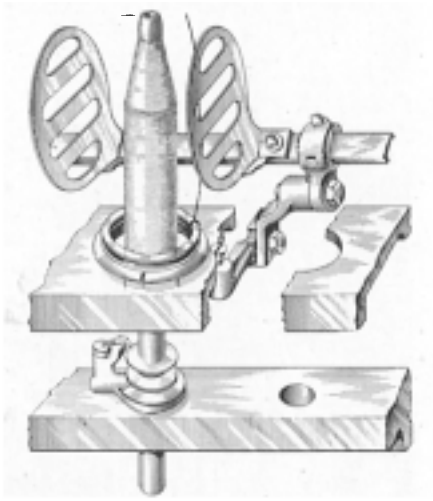
To anyone contemplating the purchase of new frames, we advocate the adoption of wider gauges than have been customary



No. 4 Automatic Separator

heretofore to use, in order to dispense with the use of separators, which with narrow gauge frames are a necessary evil. By the use of separators the yarn must receive some damage due to its whipping contact with separator blades.

To eliminate this evil we recommend **Wide Gauge Frames,** as by eliminating the whip against the separator it can be readily appreciated that a higher spindle speed can be run and a better quality of yarn obtained. In the same floor space wide gauge frames will giv a yarn production equal t that produced on narrov gauge frames with mor spindles, provided th gauge of the wide spac frame is properly adapte to the number of the yar Also, a better quality o yarn is produced at a les cost. If narrow gaug frames are ordered, we ca furnish either our No. 4 o No. 5 Separator. The No 4 is designed for use o frames having a long trav erse. The blades o stamped steel are fastened to a rod, hinged to brackets on top of auxiliary lifting rods which have a vertical reciprocating movement due to motion transmitted through the regular builder mechanism cross shaft, as will be readily understood by reference to the illustration. When doffing, the separator blades may be conveniently and quickly turned back out of the way. The No. 5 is of similar construction except the blade rod is held in brackets fixed to the ring rail.



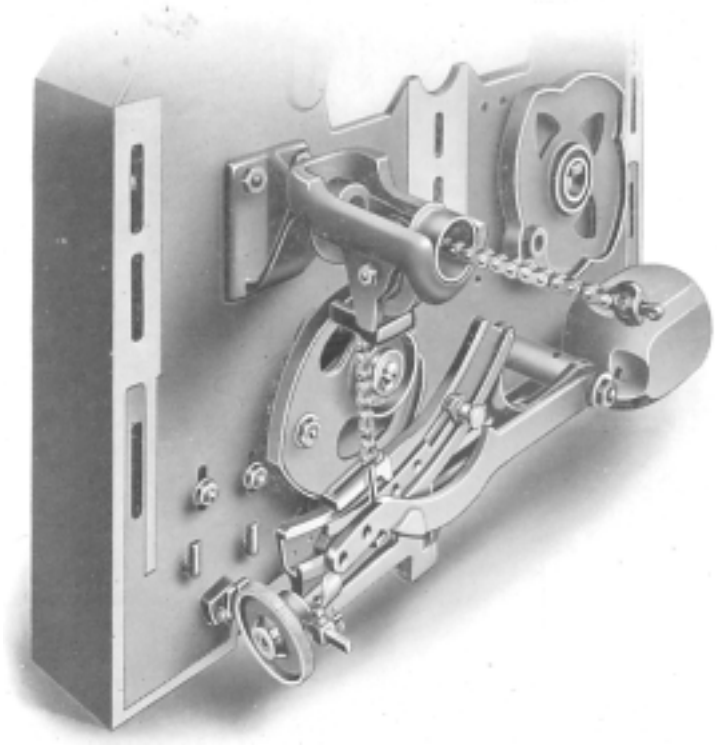
NO.5 WHITIN SEPARATOR

Metallic Thread Board

The frames are equipped with **Thread Boards** of highly polished hard wood, unless metallic thread boards are ordered.

The Whitin Patent Metallic Thread Board is

an important improvement to our frames. It consists of a sheet metal back, to which are fastened the thread guide pintal holders. This construction readily allows for lifting up each individual guide. or all the guides at once, as is required.



Builder Motion

The thread guide can be accurately adjusted to the center of the spindle by moving its shank in or out of a hole in the pintal. When correctly adjusted, it is held in a fixed position by means of a set screw at one end of the pintal. Unintentional tilting of the guides is prevented by means of our Patented locking device.

The Builder Motion is arranged for either warp or filling, or both, as desired. The change from warp to filling, or vice versa, is easily accomplished in a few minutes' time. The traverses are from 4″ to 8″. **A Locking Device** is provided for locking the ring-rail during the operation of doffing. It is located so as to be conveniently operated by the foot of the spinner before proceeding to doff. It consists of an arm pivoted to head cross shaft lifting arm in such a manner that when the lifting arm is depressed, the locking arm locks the ring-rail at its lowest point automatically; a further slight depression disengages the arm which then drops back, and the ring is free to move.

The Creels are made either one or two stories for single or double roving, and are adjustable in height for any length of roving bobbin.

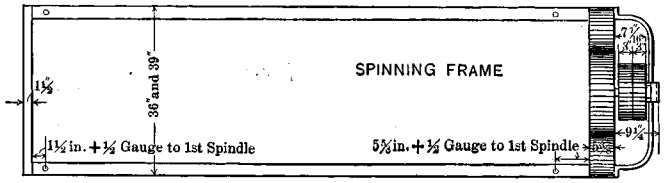
The Cylinders are substantially made, 7″ or 8″ diameter. in short lengths of best grade of material, and are well balanced for high speeds. Where spindle whirls are larger than $\frac{7}{8}$″ diameter we would advise the use of an 8″ diameter cylinder, provided, however, that the required spindle speed does not necessitate abnormal speed and sizes of countershaft pulleys. The cylinder journals run in self-oiling bearings which require oiling but once a week. By our improved setting of the boxes, the cylinders may be taken from the frame for repairs, and put back again without any readjustment. The support of the outside end of the pulley arbor serves also as a guard for the pulley and belt.

The Driving Pulleys, varing in size from 9″ diameter to 22″ diameter by 2″ to 4″ face, are placed on the head, or geared end of the frame, unless ordered to be fitted on the foot end. The loose pulley runs on a sleeve, which is integral with the yoke box supporting the pulley arbor. When the belt is on the tight pulley, the loose pulley does not revolve. The frame is equipped with a novel, patented device that furnishes sufficient tension to the belt shipping mechanism to prevent the belt from creeping from tight pulley onto loose pulley, or vice versa, and thereby stopping or starting the frame when such change is not desired. Liability of accident to an operator while changing the gearing, by the unexpected starting of the frame, is avoided by the use of a locking device applied to the belt shipping mechanism.

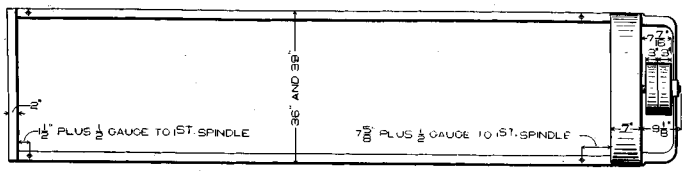
If desired, the frames may be built to be driven by an Electric Motor, either by direct connection with the cylinder arbor, or by gearing to the same.

Horse Power. The power consumed by spinning frames depends on several varying factors, viz: the number of yarn, the weight and speed of the spindles, the length of the traverse, the diameter of the rings, the band pull, the lubrication, and the temperature and humidity of the room. Owing to these varying elements it is impossible to set up a standard that will answer all requirements.

Weights. Shipping Weight, 250 pounds per foot; Net Weight, 220 pounds per foot.



FLOOR PLAN WHITIN SPINNING FRAME.
BAND DRIVE.



FLOOR PLAN WHITIN SPINNING FRAME.
TAPE DRIVE.

WHITIN SPINNING FRAME

Floor Space:—Widths 36 and 39 inches, and lengths over all for Standard Band Drive Frames, as follows:

Number of Spindles	4½ inch Space		4 inch Space		3¾ inch Space		3½ inch Space		3¼ inch Space		3 inch Space		2¾ inch Space		2⅝ inch Space		2½ inch Space		Number of Spindles
	6 Boss		6 Boss		6 Boss		6 Boss		6 Boss		8 Boss		8 Boss		8 Boss		8 Boss		
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	
112											16	0	14	10	14	3	13	8	112
120	24	6	22	0	20	9	19	6	18	3									120
128											18	0	16	8	16	0	15	4	128
132	26	9	24	0	22	7	21	3	19	10									132
144	29	0	26	0	24	6	23	0	21	6	20	0	18	6	17	9	17	0	144
156	31	3	28	0	26	4	24	9	23	1									156
160											22	0	20	4	19	6	18	8	160
168	33	6	30	0	28	3	26	6	24	9									168
176											24	0	22	2	21	3	20	4	176
180	35	9	32	0	30	1	28	3	26	4									180
192	38	0	34	0	32	0	30	0	28	0	26	0	24	0	23	0	22	0	192
204	40	3	36	0	33	10	31	9	29	7									204
208											28	0	25	10	24	9	23	8	208
216	42	6	38	0	35	9	33	6	31	3									216
224											30	0	27	8	26	6	25	4	224
228			40	0	37	7	35	3	32	10									228
240			42	0	39	6	37	0	34	6	32	0	29	6	28	3	27	0	240
252					41	4	38	9	36	1									252
256											34	0	31	4	30	0	28	8	256
264							40	6	37	9									264
272											36	0	33	2	31	9	30	4	272
276							42	3	39	4									276
288									41	0	38	0	35	0	33	6	32	0	288
300									42	7									300
304											40	0	36	10	35	3	33	8	304
312											41	0							312
320											42	0	38	8	37	0	35	4	320
336													40	6	38	9	37	0	336
352													42	4	40	6	38	8	352

Above lengths are for 3-inch Face Pulleys:—3½-inch Face add 1 inch—4-inch Face add 2 inches.
For Tape Drive Spinning Frames, add 4 inches to above lengths.

SPECIFICATIONS FOR RING SPINNING FRAMES

How many **Ring Spinning Frames**?
How many Spindles each?
Kind and Size of Spindles?
Diameter of Whorl?
Are Spindles to be Band Drive or Tape Drive?
Space between Spindles?
Number of Spindles per Roll?
Size and Flange of Rings?
Cast Iron or Plate Holders?
Size of Holders?
Are Traveller Cleaners wanted?
Warp, Filling or Combination Builder?
If Combination Builder, state if it is to be set for Warp or Filling?
Draft?
Twist per inch?
State number of Yarn to be spun?
Are Creels to be one or two story?
Are Frames to spin from Single or Double Roving?
State size of full Roving Bobbin?
State full length of Skewer?
Size of Driving Pulleys? Diameter and Width of Face?
Belt from Above or Below?
Are Driving Pulleys to be at Head or Foot End?
Traverse?
Are Frames to have Separators?
Size of Separator Blades?
Are Frames to be 36″ or 39″ wide?
Kind of Saddles?
Kind of Lever Screws?
Kind of Guide Wires?
How many teeth in Cylinder Gear, Jack Gear and Crown Gear?

Are Cylinders to be 7″ or 8″ diameter?

State distance required between Top of Bobbin and Guide Wire?

Are Frames to have Metallic Thread Board?

Are Frames to be shipped Knocked Down or On Feet?

Are Front Steel Rolls to be case hardened?

Length of Cotton to be used?

Are Hank Clocks to be furnished?

NOTE:—**Band Drive** Frames will be belted at the **Head End** and **Tape Drive** Frames will be belted at the **Foot End** unless otherwise specified.

Frames are regularly furnished with **Short Boss, Solid Top Rolls.** Please send us **Two Sample Bobbins** such as you will use on these frames. We allow five per cent. spare Top-Rolls extra and three sets Draft and Twist Gears.

EXTRAS.

Gauge, over $2\frac{3}{4}$″ for every quarter inch.

Where frames have 8 spindles per section of roll, for every 16 spindles under 208 spindles.

Where frames have 6 spindles per section of roll, for every 12 spindles under 204 spindles.

Large Gravity, or Heavy Type Spindle.

Centrifugal Clutch on Light Spindles—Standard or Medium.

Centrifugal Clutch on Large or Heavy Type Spindles.

Tape Drive.

Rings, Guaranteed Round.

Rings, Burnished.

Whitin Separators.

Dixon Adjustable Saddles.

Dixon Locking Saddles (not adjustable).

Whitin Patent Saddles.

Speakman Adjustable Lever Screws.

Palmer Patent Guide Wires.

Whitin Patent Metallic Thread Board.
Case hardened Bottom Rolls per line.
Shell Front Top-Rolls.
Self-Weighted Middle and Back Rolls.
Richard-Hinds Tube Rolls.
Solid Nickeled Roving Rods.
Tube Nickeled Roving Rods.
Hank Clocks.
Parts for applying Motor Drive.
Boxing for Knocked-down Shipment.
Cork Insert Pulleys.
Extra Cut Gearing for Draft.
Extra Cut Gearing for Twist.
Portable Sewing Machine with Stand.
Spindle Tape for Tape Drive Spinning.

ALLOWANCES.

Leather-Covered Top-Rolls, if uncovered.
Spindles not furnished.

Production Table of Ring Warp Yarn.

Front Roll 1 in. Diameter.

Number of Yarn.	Twist per Inch.	Rev. of Front Roll per Minute.	Rev. of Spindles per Minute.	Hanks per Day per Spindle.	Pounds per day per Spindle.	Number of Yarn.
4	9.50	166.0	4950	9.115	2.279	4
5	10.62	163.2	5450	8.962	1.792	5
6	11.63	161.4	5900	8.863	1.477	6
7	12.56	159.6	6300	8.764	1.252	7
8	13.43	157.6	6650	8.654	1.082	8
9	14.25	156.3	7000	8.583	.954	9
10.	15.02	153.6	7250	8.530	.853	10
11	15.75	151.5	7500	8.413	.765	11
12	16.45	150.0	7750	8.330	.694	12
13	17.12	147.8	7950	8.208	.631	13
14	17.77	145.9	8150	8.103	.579	14
15	18.39	143.6	8300	7.975	.532	15
16	19.00	141.5	8450	7.858	.497	16
17	19.58	139.7	8600	7.758	.468	17
18	20.15	138.1	8750	7.670	.429	18
19	20.70	136.0	8850	7.553	.398	19
20	21.24	134.0	8950	7.525	.376	20
21	21.76	132.3	9050	7.430	.354	21
22	22.27	130.0	9100	7.301	.332	22
23	22.78	127.8	9150	7.177	.312	23
24	23.27	125.8	9200	7.065	.294	24
25	23.75	124.6	9300	6.998	.280	25
26	24.22	123.7	9400	7.024	.270	26
27	24.68	121.9	9450	6.922	.256	27
28	25.13	120.2	9500	6.825	.244	28
29	25.58	118.2	9500	6.712	.231	29
30	26.02	116.2	9500	6.598	.220	30
31	26.44	114.4	9500	6.496	.210	31
32	26.87	112.5	9500	6.388	.200	32
33	27.28	111.4	9550	6.326	.192	33
34	27.69	110.3	9600	6.263	.184	34
35	28.10	108.7	9600	6.240	.178	35

Allowance has been made for cleaning, oiling and doffing.

Production Table of Ring Warp Yarn.

Front Roll 1 in. Diameter.

Number of Yarn.	Twist per Inch.	Rev. of Front Roll per Minute.	Rev. of Spindles per Minute.	Hanks per Day per Spindle.	Pounds per day per Spindle.	Number of Yarn.
36	28.50	108.3	9700	6.217	.173	36
37	28.89	106.8	9700	6.131	.166	37
38	29.28	106.5	9800	6.114	.161	38
39	29.66	105.2	9800	6.039	.155	39
40	29.07	106.2	9700	6.097	.152	40
41	29.44	104.9	9700	6.022	.147	41
42	29.80	103.6	9700	5.947	.142	42
43	30.13	102.5	9700	5.884	.137	43
44	30.49	101.2	9700	5.810	.132	44
45	30.82	100.2	9700	5.815	.129	45
46	31.18	99.0	9700	5.745	.125	46
47	31.51	98.0	9700	5.687	.121	47
48	31.83	97.0	9700	5.629	.117	48
49	32.20	95.9	9700	5.565	.114	49
50	32.52	94.9	9700	5.508	.110	50
55	33.34	91.6	9600	5.373	.098	55
60	34.83	87.7	9600	5.199	.087	60
65	36.27	84.2	9600	4.991	.077	65
70	37.62	81.2	9600	4.814	.069	70
75	38.10	79.4	9500	4.707	.063	75
80	39.33	76.9	9500	4.606	.058	80
85	39.64	74.0	9100	4.433	.052	85
90	40.76	71.0	9100	4.297	.048	90
95	41.88	68.5	9000	4.146	.044	95
100	42.00	65.9	8700	4.030	.040	100
110	44.01	61.5	8500	3.761	.034	110
120	44.89	58.1	8200	3.553	.030	120
130	46.74	53.1	7800	3.281	.025	130
140	47.32	47.1	7000	2.910	.021	140
150	48.96	42.9	6600	2.650	.018	150
160	50.56	37.8	6000	2.335	.015	160
170	52.12	33.6	5500	2.076	.012	170

Allowance has been made for cleaning, oiling and doffing.

Standard Warp Twist 4.75 times the square root of the number of the yarn is used up to 40's; 4.60 from 40's to 55's; 4.50 from 55's to 75's; 4.40 from 75's to 100's, and 4.30 from 100's to 170's.

Production Table of Ring Filling Yarn.

Front Roll 1 in. Diameter.

Number of Yarn.	Twist per Inch.	Rev. of Front Roll per Minute.	Rev. of Spindles per Minute.	Hanks per Day per Spindle.	Pounds per day per Spindle.	Number of Yarn.
4	7.00	182.0	4000	9.656	2.414	4
5	7.83	178.8	4400	9.483	1.897	5
6	8.57	178.3	4800	9.568	1.594	6
7	9.26	176.9	5150	9.494	1.356	7
8	9.90	175.3	5450	9.407	1.176	8
9	10.50	172.7	5700	9.267	1.030	9
10	11.07	171.0	5950	9.283	.928	10
11	11.61	168.6	6150	9.153	.832	11
12	12.12	166.7	6350	9.154	.763	12
13	12.62	164.0	6500	9.005	.693	13
14	13.10	162.7	6700	8.934	.638	14
15	13.56	160.7	6850	8.825	.588	15
16	14.00	158.0	6950	8.676	.542	16
17	14.43	156.6	7100	8.599	.506	17
18	14.85	154.3	7200	8.473	.471	18
19	15.26	152.5	7300	8.374	.441	19
20	15.65	150.4	7400	8.352	.418	20
21	16.04	148.8	7500	8.264	.394	21
22	16.42	147.3	7600	8.181	.372	22
23	16.79	145.9	7700	8.103	.352	23
24	17.15	144.7	7800	8.034	.335	24
25	17.50	142.8	7850	7.930	.317	25
26	17.85	140.0	7850	7.862	.302	26
27	17.64	141.6	7850	7.952	.295	27
28	17.99	139.7	7900	7.845	.280	28
29	18.29	137.4	7900	7.717	.266	29
30	18.35	136.9	7900	7.774	.259	30
31	18.62	135.0	7900	7.666	.248	31
32	18.64	134.9	7900	7.660	.239	32
33	18.94	133.3	7900	7.569	.229	33
34	18.95	132.7	7900	7.535	.222	34
35	19.23	130.7	7900	7.503	.214	35

Allowance has been made for cleaning, oiling and doffing.

Production Table of Ring Filling Yarn.

Front Roll 1 in. Diameter.

Number of Yarn.	Twist per Inch.	Rev. of Front Roll per Minute.	Rev. of Spindles per Minute.	Hanks per Day per Spindle.	Pounds per day per Spindle.	Number of Yarn.
36	19.50	128.9	7900	7.400	.206	36
37	19.77	127.2	7900	7.302	.195	37
38	20.03	125.5	7900	7.205	.190	38
39	20.30	123.8	7900	7.107	.182	39
40	20.55	122.3	7900	7.098	.177	40
41	20.81	120.8	7900	7.010	.171	41
42	21.06	119.4	7900	6.929	.165	42
43	21.31	117.9	7900	6.842	.159	43
44	21.56	116.6	7900	6.767	.154	44
45	21.80	115.3	7900	6.691	.149	45
46	22.04	114.1	7900	6.622	.144	46
47	22.28	112.8	7900	6.546	.139	47
48	22.52	111.6	7900	6.477	.135	48
49	22.75	110.5	7900	6.412	.131	49
50	22.98	109.4	7900	6.417	.128	50
55	24.10	104.3	7900	6.183	.112	55
60	25.16	99.9	7900	5.985	.100	60
65	25.79	96.2	7800	5.760	.088	65
70	26.75	92.8	7800	5.559	.079	70
75	27.71	89.6	7800	5.367	.072	75
80	28.16	87.0	7700	5.266	.066	80
85	29.04	83.3	7600	5.042	.059	85
90	29.39	80.1	7400	4.899	.054	90
95	30.19	78.0	7400	4.770	.050	95
100	30.50	75.1	7200	4.639	.046	100
110	31.44	69.8	6900	4.312	.039	110
120	32.85	63.0	6500	3.892	.032	120
130	34.20	57.7	6200	3.564	.027	130
140	35.49	52.9	5900	3.248	.023	140
150	36.72	48.6	5600	3.002	.020	150
160	37.92	44.5	5300	2.750	.017	160
170	39.09	40.8	5000	2.520	.015	170

Allowance has been made for cleaning, oiling and doffing.

Standard Filling Twist 3.50 times the square root of the number of the yarn is used up to 27's; 3.40 from 27's to 34's; 3.25 from 34's to 60's; 3.20 from 60's to 100's, and 3.00 from 100's to 170's.

Production Table of Ring Hosiery Yarns.

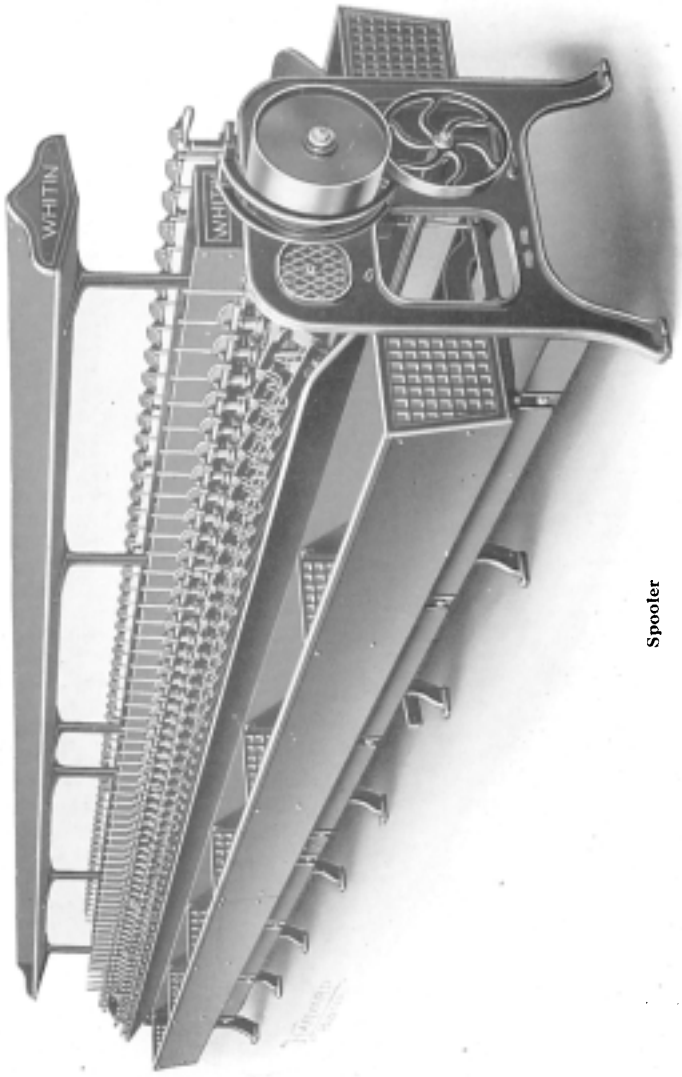
Front Roll 1 in. Diameter.

Number of Yarn	Twist per Inch	Rev. of Front Roll per Minute	Rev. of Spindles per Minute	Hanks per day per Spindle	Pounds per day per Spindle	Number of Yarn
2	4.24	210.0	2800	10.989	5.495	2
3	5.20	189.7	3100	9.927	3.309	3
4	6.00	180.3	3400	9.435	2.359	4
5	6.71	175.4	3700	9.179	1.836	5
6	7.35	173.2	4000	9.063	1.511	6
7	7.94	168.3	4200	8.807	1.258	7
8	8.49	164.9	4400	8.733	1.092	8
9	9.00	162.6	4600	8.611	.957	9
10	9.49	161.0	4800	8.526	.853	10
11	9.95	159.9	5000	8.468	.770	11
12	10.39	157.7	5150	8.449	.704	12
13	10.82	157.4	5350	8.433	.649	13
14	11.22	156.3	5500	8.374	.598	14
15	11.62	154.7	5650	8.289	.553	15
16	12.00	153.8	5800	8.241	.515	16
17	12.37	151.7	5900	8.222	.484	17
18	12.73	150.0	6000	8.130	.446	18
19	13.08	148.4	6100	8.043	.423	19
20	13.42	144.6	6100	7.927	.396	20
21	13.75	141.2	6100	7.741	.369	21
22	14.07	140.2	6200	7.686	.349	22
23	14.39	137.1	6200	7.516	.327	23
24	14.70	134.2	6200	7.441	.310	24
25	15.00	133.7	6300	7.414	.297	25
26	15.30	131.0	6300	7.349	.283	26
27	15.59	128.6	6300	7.214	.267	27
28	15.87	126.3	6300	7.085	.253	28
29	16.16	124.0	6300	6.956	.240	29
30	16.43	123.9	6400	6.950	.232	30

Allowance has been made for cleaning, oiling and doffing.

The Twist per inch in the above table is 3 times the square root of the number of the yarn.

SPOOLING



Spooler

IMPROVED SPOOLER

The accompanying cut shows clearly the general features of construction of our **Improved Spooler.** The frame is of a substantial and pleasing design, the end legs being connected together by four rigid iron bars, or girts, supported at frequent intervals by heavy sampsons. The two top bars serve to hold the spindle bolsters, thus furnishing a solid foundation with a minimum amount of vibration for the spindles at any economical speed.

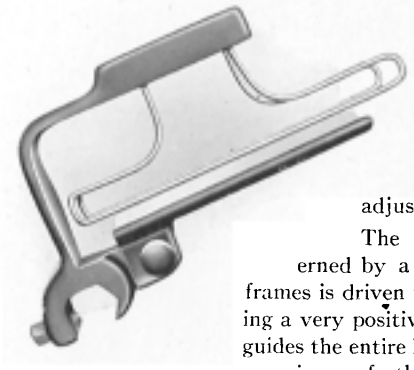
Adjustable feet are provided for th sampsons and ends whereby the levelling of th frame is easily done.

The **Spindles** are as light as is consistent with the work demanded of them. The bolster case is constructed with a chamber holding a generous supply of oil, so that oiling is required not more than once a month. The bolsters are provided with the well-known Woodmancy oil hole cap and spindle retainer.

In **banding the spindles** one band drives two spindles, one on each side of the frame. To avoid cross banding at the end of the cylinder, two spindles, one on each side of the frame, have double whirls and use two bands.

Spooler Spindle

The frames are built to wind from warp, filling or twister bobbins as ordered. When warp bobbins are used, the frame is equipped with the well-known Wade type of **bobbin holder,** which has given universal satisfaction for years in many mills. For filling bobbins or cops, the frame is fitted with skewers, fastened to rods on each side of the frame. Side spindles are provided in order



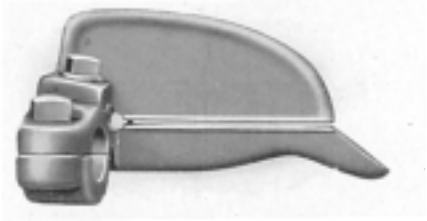
Bobbin Holder

to wind from twister bobbins.

The **Thread Guide** is easily adjusted and firmly held in position for the different numbers of yarn by means of an inclined adjusting foot and holding screw.

The **Traverse-Motion** is governed by a mangle wheel, and on long frames is driven from both ends, thus ensuring a very positive and steady motion to the guides the entire length of the frame, thereby ensuring perfectly wound spools. The wave of traverse shaft is so placed that the levers operating the lifting rods are well up from the floor, thus preventing any possibility of breakage of the mangle wheel, owing to the levers striking a spool that may have fallen under the frame.

The frame is fitted with a **locking belt shipper** for both overhead and underneath belts.



Guide

Floor space: Width, 4 feet over all; lengths and spaces, as per table on following page. Driving pulleys are 8 to 14 inches diameter, $2\frac{1}{2}$ in. face, and run from 160 to 200 revs. per minute.

Horse power: 200 spindles per horse power.

Weights: Shipping weight, 160 pounds per foot; net weight, 135 pounds per foot.

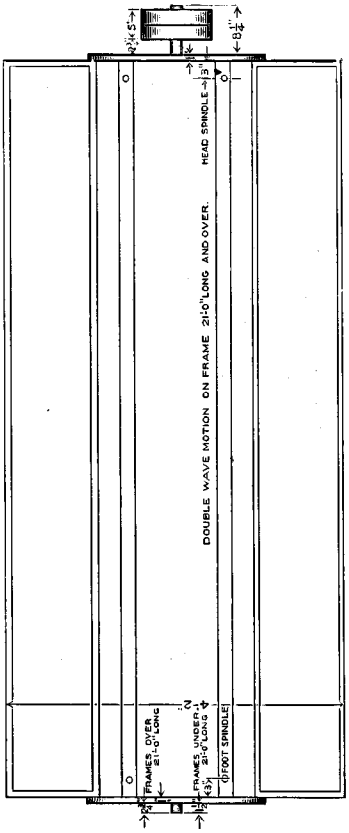
SPECIFICATIONS FOR SPOOLERS

How many Spoolers?
How many Spindles each?
Diameter of Spindles? (See Note Below).
Space between Spindles?
Traverse?
What Guide?
Size of Driving Pulleys? Diameter and Width of Face?
Belt from Above or Below?
Will you use Side Spindles, Bobbin Holders or Skewers?
Will you Spool from Warp or Filling Bobbins?
If from Filling Bobbins, what Tension?
State size of Bobbin you will spool from?
State number of Yarn to be spooled?
Note:—All Spoolers will be furnished with Side Boxes unless other-wise specified

All **Spooler Spindles** will be made $\frac{3}{8}$" **Diameter** unless otherwise specified.

EXTRAS.

Spoolers above 5" Gauge, per quarter inch.
Spoolers less than 100 Spindles and down to and including 80-Spindle machine.
Spoolers from 79 spindles down to and including 60 Spindles
Spoolers from 59 Spindles down to and including 40 Spindles
Regular Spooler Spindle furnished is $\frac{3}{8}$" diameter for Spindles $\frac{1}{2}$" diameter add
Filling-Wind Tension Device.



Floor Plan of Spooler

SPOOLER.

Floor Space.

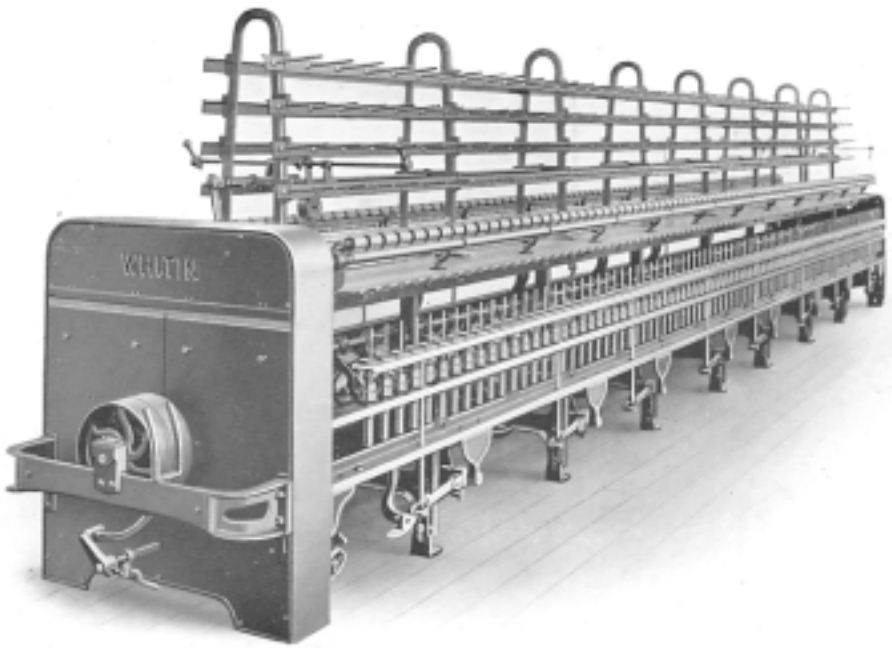
No. of Spindles	3½ in. Space.		3¾ in. Space.		4 in. Space.		4¼ in. Space.		4½ in. Space.		4¾ in. Space.		5 in. Space.		5¼ in. Space.		5½ in. Space.		5¾ in. Space.		6 in. Space.	
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
40	7	¼	7	5	7	9¾	8	2½	8	7¼	9	0	9	4¾	9	9½	10	2¼	10	7	10	11¾
50	8	5¾	8	11¾	9	5¾	9	11¾	10	5¾	10	11¾	11	5¾	11	11¾	12	5¾	12	11¾	13	5¾
60	9	11¼	10	6½	11	1¾	11	9	12	4¼	12	11½	13	6¾	14	2	14	9¼	15	4½	15	11¾
70	11	4¾	12	1¼	12	9¾	13	6¼	14	2¾	14	11¼	15	7¾	16	4½	17	¾	17	9¼	18	5¾
80	12	10¼	13	8	14	5¾	15	3½	16	1¼	16	11	17	8¾	18	6½	19	4¼	20	2	20	11¾
90	14	3¾	15	2¾	16	1¾	17	¾	17	11¾	18	10¾	19	9¾	20	8¾	21	9	22	8	23	7
100	15	9¼	16	9½	17	9¾	18	10	19	10¼	20	10½	22	0	23	¼	24	½	25	¾	26	1
110	17	2¾	18	4¼	19	5¾	20	7¼	21	10	22	11½	24	1	25	2½	26	4	27	5½	28	7
120	18	8¼	19	11	21	3	22	5¾	23	8½	24	11¼	26	2	27	4¾	28	7½	29	10¼	31	1
130	20	1¾	21	7	22	11	24	3	25	7	26	11	28	3	29	7	30	11	32	3	33	7
140	21	7¼	23	1¾	24	7	26	¼	27	5½	28	10¾	30	4	31	9¼	33	2½	34	7¾	36	1
150	23	2	24	8½	26	3	27	9½	29	4	30	10½	32	5	33	11½	35	6	37	½	38	7
160	24	7½	26	3¼	27	11	29	6¾	31	2½	32	10¼	34	6	36	1¾	37	9½	39	5¼	41	1
170	26	1	27	10	29	7	31	4	33	1	34	10	36	7	38	4	40	1	41	10	43	7
180	27	6½	29	4¾	31	3	33	1¼	34	11½	36	9¾	38	8	40	6¼	42	4½	44	2¾	46	1
190	29	0	30	11½	32	11	34	10½	36	10	38	9½	40	9	42	8½	44	8	46	7½	48	7
200	30	5½	32	6¼	34	7	36	7¾	38	8½	40	9¼	42	10	44	10¾	46	11½	49	¼	51	1

Double Wave Motion used on Frames 21", 0" and over.

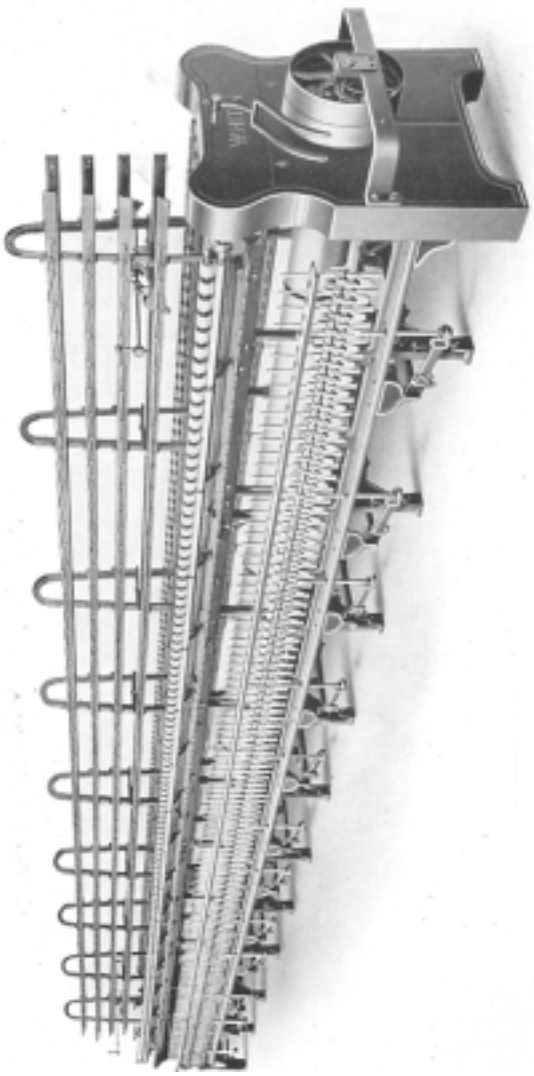
Production Table of Spooler.

Dimensions of Spools.		Number of Yarn.	Revolutions per Minute of			No. Whitin Gravity Spindles to one Spooler Spindle at 825 Rev.
Length between Heads.	Diameter of Heads.		Cyl. 167, Spindle 750	Cyl. 184, Spindle 825	Cyl. 200. Spindle 900	
			Pounds per Day per Spindle.			
6 in.	5 in.	8	10.8	11.8	12.9	12
		10	8.6	9.5	10.3	
		12	7.2	7.9	8.6	
		14	6.2	6.8	7.4	13
		16	5.4	5.9	6.5	
		18	4.8	5.3	5.8	
5 in.	4 in.	20	4.3	4.8	5.2	14
		22	3.9	4.3	4.7	
		24	3.6	4.0	4.3	
		26	3.3	3.7	4 0	15
		28	3.1	3.4	3.7	
		30	2.9	3.2	3.5	
		32	2.7	3.0	3.3	16
		34	2.6	2.8	3.1	
		36	2.4	2.7	2.9	17
		38	2.3	2.5	2.7	
4½ in.	3½ in.	40	2.2	2.4	2·6	18
		44	2.0	2.2	2.4	19
		50	1.8	1.9	2.1	20
3½ in.	3¼ in.	60	1.5	1.6	1.8	21
		70	1.3	1.4	1.5	23
		80	1.1	1.2	1.3	25
3 in.	2¾ in.	90	1.0	1.1	1.2	27
		100	.9	1.0	1.1	30


TWISTING



Twisting Frame with Tape Driven Spindles



Twisting Frame with Band Driven Spindles

TWISTING FRAMES

Progress in all textile machinery is the result of long and painstaking experiment and development on the part of the builders, coupled with the experience and suggestions of the mills. **The Whitin Twisters** are the results of such an evolution and embody those necessary and desirable features which long and successful operation in the mills has demonstrated as indispensable.

The standard of proportions is the outcome of what has been deemed best for practical working conditions. The general assembly of parts is so well balanced that these Twisters meet efficiently every condition which arises in the running of twisted work. They are easy and convenient to operate, changes of gearing are readily made, and all parts are accessible. In design, construction and economy of operation we invite comparison.

Owing to the interest at the present time in Tape Driven Spindles, we are particularly calling attention to the new **Whitin Tape Drive Twister.** This type of frame, while comparatively recent in development, is becoming increasingly popular. It furnishes a more positive drive to the spindle, and a more even tension than is possible on the band drive frame. It is simple in construction, and on coarse work particularly is to be recommended. The Whitin application of the Tape Drive is very simple, positive and easily adjusted. For mills considering the Tape Drive on Twisters, we do not hesitate to recommend this as the most practicable arrangement that has yet been developed.

The most prominent feature of a **Tape Drive Frame** as compared with a Band Drive is the use of a flat whirl on the spindle, which is driven by a tape from $\frac{5}{8}''$ to $1\frac{3}{4}''$ in width. Each tape drives four spindles, and the tension of the tape is maintained by an idler, or tension pulley, which is directly weighted to give the necessary tension to the driving tape. The tension pulley, held

in an adjustable hanger, runs in removable, wooden, oilless bearings. The hangers which hold the pulleys are in turn supported by a long shaft, extending the full length of the frame. The shaft can be put on either side of the frame, as may be required, and all parts are easily and readily adjusted.

The customary arrangement of band drive is used on the Twister when the tape is not furnished, the spindle being directly driven by a band from the cylinder.

A brief description of the features common to both tape and band drive frames may be of interest. The frames are constructed with exceptionally heavy ends, sampsons, roll beams and bolster rails, so designed as to practically eliminate all vibrations due to high speed operation, thus ensuring first quality of work and **large productive capacity.** They are built in sizes to accommodate the number of spindles and spaces desired to fit the requirements of our customers.

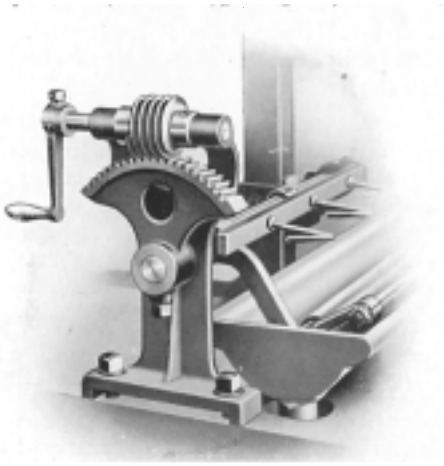
Adjustable feet are provided for the sampsons and foot ends in order to facilitate the levelling of the frame.

The frames are equipped for either dry or wet twisting, as desired. For **wet twisting,** the yarn is drawn from the creel through water contained in a trough placed behind the rolls. The troughs are so arranged that they can be connected with the water and drain system of the mill, so that a continuous circulation of clean water may be maintained, thus ensuring cleanliness of the yarn in its passage through the water. The troughs are made of sheet brass, with rolled over sides, which gives them sufficient strength to withstand all ordinary usage. They are made in sections corresponding to the different sections of the frame, these sections being so bolted together as to prevent leakage.

The creels, arranged for any number of ply as desired, are of our improved "all iron" style, consisting of cast-iron uprights supporting skewer rails of angle iron, rigidly held in proper position, and easily adjusted or removed.

The twist and builder motion gearings are inclosed in a boxed end, ready access to which is obtained by removable panels, held in position by efficient locking devices. All gearing is machine

cut, and the teeth have exceptionally wide faces, which feature ensures comparatively silent running and freedom from expensive repairs. The twist gearing is so designed that a wide range in different twist combinations is afforded. At the option of the purchaser, the twist gearing may be arranged to drive each side of the frame independently of the other, thereby producing two different twists at the same time.



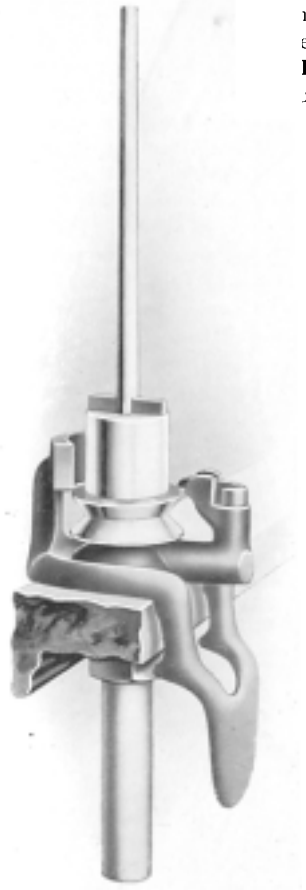
Trough Roll-Lifter

The rolls, $1\frac{1}{2}''$ in diameter, are furnished in two styles, viz.: two lines of bottom rolls, with single line of heavy top-rolls, generally used for heavy dry twisting; and single line of bottom rolls with single line of top-rolls, applicable to either wet or dry twisting. **For dry twisting,** the bottom rolls are of steel and the top-rolls of polished cast-iron. For wet twisting, the rolls are of brass, or brass covered, and the yarn is held under the water contained in a trough by glass rods, or revolving brass rolls, supported by lifting arms at frequent intervals on a lifter shaft, which extends the length of the frame back of the trough. In order to free the yarn from the water, or to clean the trough, a simple and effective lifting device is provided at foot end of frame

Metallic Thread Board

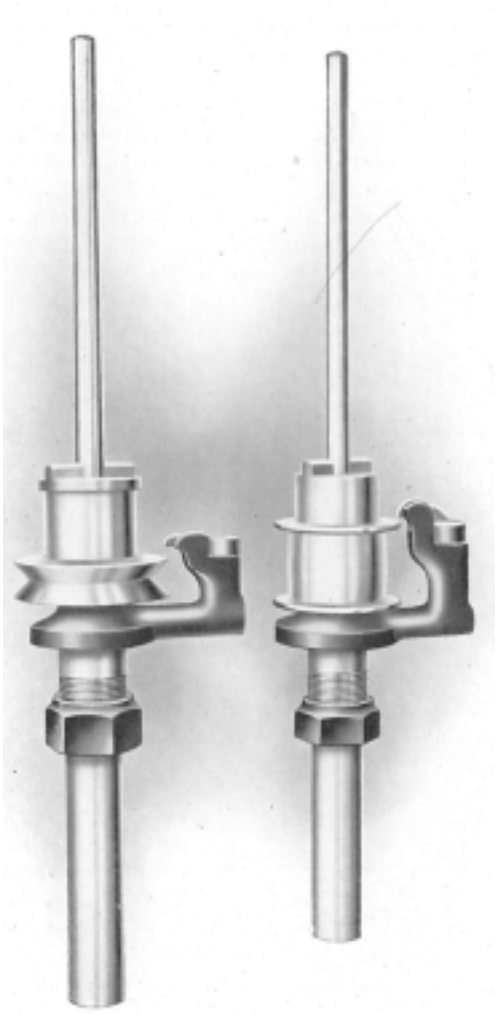
A Traverse-motion for preventing creasing of the rolls by the yarn is operated by means of a worm and gear driving a trav-
ı, thus giving a uniform motion to
e rod.

Thread Boards are of highly pol-
ɔod, in connection with which any of the usual forms of wire or porcelain guides are furnished, unless metallic thread boards are ordered. Our patent metallic thread board consists of thread guide pintal holders fastened to a light angle iron back, hinged to the roll beam. This construction allows for lifting up each individual guide, or all the guides on each side simultaneously, as desired. The thread guide can be accurately adjusted to the center of the spindle by moving it in or out of a hole in the pintal. When correctly adjusted, it is securely fastened by means of a set screw at one end of the pintal. For dry twisting, the guides, hinges and screws are made of steel, whereas for wet twisting these parts are of brass, which, being non-corrosive, eliminates the danger of rust staining the yarn. A simple and effective **thread board-lifter** is applied to each side of the frame by means of which the guides are all lifted together before the bobbins are to be doffed.



Spindle and Brake

The Spindles with which these frames are equipped, are of the well-known Whitin Gravity Im-



Twisting Spindles

proved Type, fitted for either band or tape driving, and are made in the following regular sizes:

Light Twisting Spindle, diameter of whirl, $1\frac{1}{16}$".
Heavy Twisting Spindle, diameter of whirl, $1\frac{5}{16}$".
Extra Heavy Twisting Spindle, No. 1, diameter of whirl, $1\frac{5}{16}$".
Extra Heavy Twisting Spindle, No. 2, diameter of whirl, $1\frac{5}{8}$".
Extra Heavy Twisting Spindle, No. 3, diameter of whirl, 2".
Extra Heavy Twisting Spindle, No. 4, diameter of whirl, $2\frac{1}{2}$".

To suit special conditions, the Light Twisting Spindle may be fitted with $\frac{7}{8}$", 1" or $1\frac{1}{8}$" diameter whirls, and $1\frac{1}{4}$" whirl may be had on the Extra Heavy Twisting Spindle.

A simple and effective **knee-brake** is provided for each spindle, either tape or band driven, by means of which the motion of the spindle can be arrested for the purpose of piecing up. The brake, made of cast-iron, consists of a knee plate, a holder to hold it in position on the bolster rail, and a leather friction pad, through which the braking action is applied to the upper part of the whirl whenever the operative slightly presses his knee against the knee plate.

The frames are equipped with any of the various styles and sizes of **rings,** as suits the requirements of the purchaser.

The builder motion is arranged to form bobbins with straight

Vertical Ring

top, taper top, warp or filling winds, with traverses from four to seven inches. The change from one wind to another is quickly and easily accomplished. A locking device is used for locking the ring rail during the operation of doffing. It consists of an arm pivoted to the head cross shaft lifting arm in such a position that when the lifting arm is depressed, the locking arm locks the ring rail at its lowest point automatically. A slight depression by the foot of the operative on the pedal of the locking arm disengages it from locking position, and then the ring rail is free to move.

The Ring-Rails are conveniently levelled by means of an adjusting screw on the hub of each lifting arm.

The Cylinders may be seven inches or eight inches in diameter, as ordered. Their journals run in self-oiling boxes, requiring oiling but once a week. The settings of the boxes are so arranged that the cylinders can be readily taken out for repairs and returned without any readjustments being required.

The Driving Pulleys range from 6″ to 22″ in diameter, with 2″ to 4″ face. They are located on the geared or foot end of the frame as ordered. The loose pulley runs on a sleeve, which is integral with the yoke box supporting the outer end of the driving arbor. By this construction, excessive wear is eliminated in the bearing of the loose pulley, for the reason that the loose pulley is stationary when the belt is on the tight pulley. The support for the outer box of the pulley arbor also serves as a guard for the pulley and belt.

The frames may be arranged when so ordered to be driven by an **electric motor,** either by direct connection with the cylinder arbor, or by gearing to the same.

The Belt Shipping Mechanism is so designed that the operative can stop the frame at either the foot or head end, as desired. A locking device to the shipping mechanism is provided which prevents accidental starting of the frame, thus avoiding possible injury to an operative while in the act of changing the gearing.

Weights: Shipping weight, 250 pounds per foot; net weight, 220 pounds per foot.

SPECIFICATIONS FOR TWISTERS

How many **Twisters**
Wet or Dry Twisting?
How many Spindles each?
Size of Spindles?
Diameter of Whorl?
Are Spindles to be Band Drive or Tape Drive?
Space between Spindles?
Size and Flange of Rings?
Band, Common Single Adjustable or Vertical Rings?
If Band Ring in Brass Plate Holder, state Size of Holder?
Number of Yarn to be twisted?
How many Doublings into one?
How many Creel Spindles per Twister Spindle?
How many rails high are Creels to be made?
Size of Spool to be used on Creels?
Distance between Creel Rails?
Length of Creel Spindles overall?
Size of Driving Pulleys? Diameter and Width of Face?
Belt from Above or Below?
Are Driving Pulleys to be at Head or Foot End?
Are Belt Guards to be furnished?
Twist per inch?
How many Lines of Bottom Rolls?
Length of Traverse?
Straight, Filling, Warp or Combination Builder?
If Combination Builder, set for what wind?
Will you use Long Wind with Taper Top? Regular or Reverse?
Are Twisters to have Metallic Thread Board?
Style of Guide?
Are Knee Brakes to be furnished?
How many teeth in Cylinder Gear and Jack Gear?
Are Cylinders to be 7″ or 8″ diameter?
Are Twisters to be 36″ or 39″ wide?
State distance required between Top of Bobbin and Guide?
Are Twisters to be shipped, knocked down or on feet?
Are Top-Rolls to be grooved?
Are Top-Rolls to be Regular $2\frac{1}{8}$″ dia., or Heavy $2\frac{1}{2}$″ dia.?
Are Hank Clocks to be furnished?

NOTE:—**Band Drive** Frames will be belted at the **Head End** and **Tape Drive** Frames will be belted at the **Foot End** unless otherwise specified.

Please send us a sample **Bobbin** and a sample **Spool** such as you will use on these Twisters. If these machines are to match present equipment please send sample **Spindle, Ring, Ring Holder** and **Guide.** We allow 3 Twist Change Gears with each Twister.

EXTRAS.

Wet Twisters, with Single Line Top and Bottom Rolls, add per inch of space.

Tape Drive, 5″ Gauge and Below, up to and including $1\frac{1}{4}$″ Tape.

Tape Drive, above 5″ Gauge or above $1\frac{1}{4}$″ Tape.

Tape Drive, 2 Spindles per Tape.

Creels above 4-ply, for each Ply.

Whitin Metallic Thread Boards for Dry Twisters.

Whitin Special Metallic Thread Boards with Porcelain Eye for Wet Twisters.

Knee Brakes for Spindles.

Hank Clocks.

Individual Motor Drive.

Cork Insert Pulleys.

Stop Motions for 2-Ply Work.

Separators.

Measuring Knock-off.

Wider Gauge Twister than $5\frac{1}{2}$″, for each $\frac{1}{2}$″ Additional Width add

Boxing for Knocked-down Shipment.

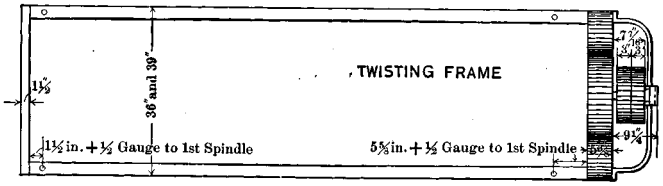
Extra Twist Gears.

Portable Sewing Machine with Stand.

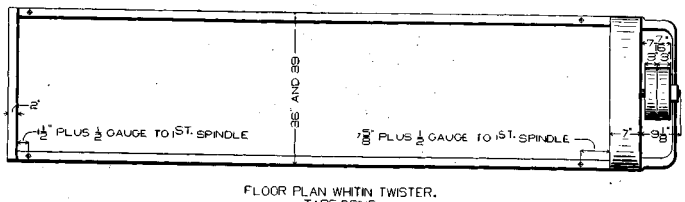
Spindle Tape.

ALLOWANCES.

For Creels left off.



FLOOR PLAN WHITIN TWISTER.
BAND DRIVE.



FLOOR PLAN WHITIN TWISTER.
TAPE DRIVE.

NEW MODEL TWISTER

Floor Space:—Widths 36 and 39 inches and lengths over all for Standard Frames, as follows:

No. of Spindles	6 inch Space		5½ inch Space		5 inch Space		4½ inch Space		4 inch Space		3¾ inch Space		3½ inch Space		3¼ inch Space		3 inch Space		2¾ inch Space		No. of Spindles
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	
60	17	0	15	9	14	6	13	3	12	0	11	5	10	9	10	2	9	6	8	11	60
64	18	0	16	8	15	4	14	0	12	8	12	0	11	4	10	8	20	0	9	4	64
72	20	0	18	6	17	6	15	6	14	0	13	3	12	6	11	9	11	0	10	3	72
80	22	0	20	4	18	8	17	0	15	4	14	6	13	8	12	10	12	0	11	2	80
84	23	0	21	3	19	6	17	9	16	0	15	2	14	3	13	5	12	6	11	8	84
88	24	0	22	2	20	4	18	6	16	8	15	11	14	10	13	11	13	0	12	1	88
96	26	0	24	0	22	0	20	0	18	0	17	0	16	0	15	0	14	0	13	0	96
104	28	0	25	10	23	8	21	6	19	4	18	3	17	2	16	1	15	0	13	11	104
108	29	0	26	9	24	6	22	3	20	0	18	11	17	9	16	8	15	6	14	5	108
112	30	0	27	8	25	4	23	0	20	8	19	6	18	4	17	2	16	0	14	10	112
120	32	0	29	6	27	0	24	6	22	0	20	9	19	6	18	3	17	0	15	9	120
128	34	0	31	4	28	8	26	0	23	4	22	0	20	8	19	4	18	0	16	8	128
132	35	0	32	8	29	6	26	9	24	0	22	8	21	3	19	11	18	6	17	2	132
144	38	0	35	0	32	0	29	0	26	0	24	6	23	0	21	6	20	0	18	6	144
160	42	0	38	8	35	4	32	0	28	8	27	0	25	4	23	8	22	0	20	4	160
168			40	6	37	0	33	6	30	0	28	3	26	6	24	9	23	0	21	3	168
176					38	8	35	0	31	4	29	6	27	8	25	10	24	0	22	2	176
192					42	0	38	0	34	0	32	0	30	0	28	0	26	0	24	0	192
208							41	0	36	8	34	6	32	4	30	2	28	0	25	10	208
216									38	0	35	9	33	6	31	3	29	0	26	9	216
224									39	4	37	0	34	8	32	4	30	0	27	8	224
240									42	0	39	6	37	0	34	6	32	0	29	6	240
256											42	0	39	4	36	8	34	0	31	3½	256
272													41	8	38	10	36	0	33	2	272
280															39	11	37	0	34	1	280
288																	38	0	35	0	288
292																	38	6	35	6	292

Note:—Above lengths are for band drive frames, add 4 inches for tape drive frames.
For 3½ inch face pulley add 1 inch—4 inch face add 2 inches.

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—2 Ply.

No of Yarn to be Twisted.	Rev of Spindle per Minute.	Multiplier 4.			Multiplier 5.			Multiplier 6.			Space of Frame in Inches	Dia. of Ring in Inches
		Rev. per Min.		Pounds per Spindle.	Rev. per Min.		Pounds per Spindle.	Rev. per Min.		Pounds per Spindle.		
		1⅜"Roll	1½"Roll		1⅜"Roll	1½"Roll		1⅜"Roll	1½"Roll			
6	4500	150.3	137.8	3.97	120.3	110.3	3.18	100.3	91.9	2.65	4	3
7	4750	147.0	134.8	3.33	117.6	107.8	2.67	98.0	89.8	2.22		
8	5000	144.7	132.6	2.87	115.7	106.1	2.29	96.4	88.4	1.91		
9	5200	141.8	130.0	2.50	113.4	104.0	2.01	94.6	86.7	1.67		
10	5300	137.2	125.8	2.18	109.7	100.6	1.75	91.4	83.8	1.46		
11	5500	135.8	124.5	1.96	108.5	99.5	1.57	90.5	83.0	1.30		
12	5500	130.0	119.1	1.71	103.9	95.2	1.38	86.6	79.4	1.15		
13	5650	128.2	117.5	1.57	102.6	94.1	1.25	85.5	78.4	1.05	3½	2⅝
14	5750	125.8	115.3	1.43	100.6	92.2	1.14	83.9	76.9	0.96		
15	5900	124.7	114.3	1.31	99.8	91.5	1.06	83.0	76.1	0.88		
16	6000	122.8	112.6	1.22	98.2	90.0	0.98	81.8	75.0	0.81		
17	6000	119.1	109.2	1.12	95.2	87.3	0.89	79.4	72.8	0.74	3¼	2¼
18	6050	116.6	106.9	1.03	93.5	85.7	0.82	77.8	71.3	0.69		
19	6100	114.5	105.0	0.96	91.6	84.0	0.77	76.4	70.0	0.64		
20	6150	112.5	103.1	0.91	90.0	82.5	0.73	75.0	68.8	0.60		
22	6300	109.9	100.7	0.80	87.9	80.6	0.64	73.3	67.2	0.54		
24	6500	108.5	99.5	0.73	86.8	79.6	0.58	72.4	66.4	0.49		
26	6650	106.7	97.8	0.66	85.4	78.3	0.53	71.2	65.3	0.44		
28	6800	105.1	96.3	0.60	84.1	77.1	0.48	70.1	64.3	0.40		
30	6900	103.0	94.4	0.55	82.4	75.5	0.44	68.7	63.0	0.37	3	2
32	7000	101.3	92.9	0.51	81.0	74.3	0.41	67.6	62.0	0.34		
34	7000	98.2	90.0	0.46	78.5	72.0	0.37	65.5	60.0	0.31		
36	7000	95.5	87.5	0.42	76.4	70.0	0.34	63.6	58.3	0.29		
38	7000	92.9	85.2	0.39	74.3	68.1	0.32	61.9	56.7	0.26		
40	7000	90.6	83.1	0.37	72.5	66.5	0.30	60.4	55.4	0.24		
50	7500	86.8	79.6	0.28	69.4	63.6	0.22	57.9	53.1	0.19		
60	7500	79.2	72.6	0.22	63.4	58.1	0.17	52.8	48.4	0.15	2¾	1¾
70	7500	73.4	67.3	0.18	58.7	53.8	0.14	48.9	44.8	0.12		

Allowance has been made for waste, cleaning, oiling and doffing.

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—3 Ply.

No of Yarn to be Twisted.	Rev. of Spindle per Minute.	Multiplier 4.			Multiplicr 5.			Multiplier 6.			Space of Frame in Inches	Dia. of Ring in Inches
		Rev. per Min.		Pounds per Spindle.	Rev. per Min.		Pounds per Spindle.	Rev. per Min.		Pounds per Spindle.		
		1⅜"Roll	1½"Roll		1⅜"Roll	1½"Roll		1⅜"Roll	1½"Roll			
6	4000	163.6	150.0	6.48	130.9	120.0	5.18	109.1	100.0	4.33	4½	3½
7	4300	162.9	149.3	5.54	130.3	119.4	4.43	108.6	99.6	3.69		
8	4550	161.2	147.8	4.80	129.1	118.3	3.83	107.5	98.5	3.20		
9	4800	160.4	147.0	4.23	128.3	117.6	3.38	106.9	98.0	2.82		
10	5000	158.6	145.4	3.77	126.7	116.2	3.02	105.7	96.9	2.51		
11	5200	157.1	144.0	3.39	125.8	115.3	2.71	104.8	96.1	2.26		
12	5350	154.8	141.9	3.07	123.8	113.5	2.46	103.2	94.6	2.05		
13	5500	152.8	140.1	2.80	122.3	112.1	2.24	101.9	93.4	1.87	4	3
14	5600	150.0	137.5	2.54	120.0	110.0	2.03	100.0	91.7	1.69		
15	5750	148.8	136.4	2.36	119.0	109.1	1.89	99.2	90.9	1.57		
16	5850	146.6	134.4	2.18	117.2	107.4	1.74	97.7	89.6	1.45		
17	5850	142.2	130.4	1.99	113.8	104.3	1.59	94.8	86.9	1.33		
18	5950	140.5	128.8	1.86	112.4	103.0	1.49	93.7	85.9	1.24		
19	6000	137.9	126.4	1.72	110.4	101.2	1.38	92.0	84.3	1.15		
20	6000	134.5	123.3	1.60	107.6	98.6	1.28	89.7	82.2	1.07	3½	2½
22	6000	128.2	117.5	1.39	102.5	94.0	1.12	85.5	78.4	0.93		
24	6000	122.8	112.6	1.22	98.2	90.0	0.98	81.9	75.1	0.81		
26	6100	120.1	110.1	1.09	95.9	87.9	0.87	80.0	73.3	0.73		
28	6250	118.4	108.5	1.01	94.7	86.8	0.81	78.9	72.3	0.67		
30	6400	117.1	107.3	0.94	93.7	85.9	0.75	78.1	71.6	0.63	3¼	2¼
32	6500	115.2	105.6	0.86	92.1	84.4	0.69	76.8	70.4	0.57		
34	6500	111.8	102.5	0.79	89.4	82.0	0.63	74.5	68.3	0.53		
36	6500	108.5	99.5	0.73	86.9	79.7	0.58	72.4	66.4	0.49		
38	6500	105.6	96.8	0.67	84.5	77.5	0.54	70.5	64.6	0.45		
40	6500	102.9	94.3	0.62	82.4	75.5	0.50	68.7	63.0	0.41	3	2
50	7000	99.2	90.9	0.47	79.3	72.8	0.38	66.2	60.7	0.31	2¾	1¾
60	7000	90.5	83.0	0.37	72.5	66.5	0.30	60.4	55.4	0.25		
70	7000	83.8	76.8	0.30	67.1	61.5	0.24	55.9	51.2	0.20		

Allowance has been made for waste, cleaning, oiling and doffing.

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—4 Ply.

No. of Yarn to be Twisted.	Rev. of Spindle per Minute.	Multiplier 4.			Multiplier 5.			Multiplier 6.			Space of Frame in Inches	Dia. of Ring in Inches
		Rev. per Min.		Pounds per Spindle.	Rev. per Min.		Pounds per Spindle.	Rev. per Min.		Pounds per Spindle		
		1⅜"Roll	1½"Roll		1⅜"Roll	1½"Roll		1⅜"Roll	1½"Roll			
6	3500	165.3	151.5	8.73	132.3	121.3	6.98	110.2	101.0	5.82	5	4
7	3750	163.2	149.0	7.39	131.3	120.4	5.95	109.3	100.2	4.95		
8	3950	161.5	148.0	6.40	129.3	118.5	5.13	107.7	98.7	4.27		
9	4100	158.2	145.0	5.57	126.5	116.0	4.46	105.5	96.7	3.72		
10	4300	157.5	144.4	4.99	125.8	115.3	3.99	104.9	96.2	3.33		
11	4450	155.4	142.5	4.48	124.3	113.9	3.58	103.5	94.9	2.98		
12	4600	153.7	140.9	4.07	123.0	112.8	3.25	102.5	94.0	2.71		
13	4700	151.0	138.4	3.69	120.8	110.7	2.94	100.6	92.2	2.46	4½	3½
14	4800	148.5	136.1	3.36	118.8	108.9	2.69	99.0	90.8	2.24		
15	4900	146.3	134.1	3.09	117.2	107.4	2.48	97.6	89.5	2.06		
16	5000	144.7	132.6	2.87	115.7	106.1	2.29	96.4	88.4	1.91		
17	5100	143.1	131.2	2.67	114.5	105.0	2.13	95.4	87.5	1.78		
18	5200	141.7	129.9	2.50	113.4	104.0	2.00	94.5	86.6	1.67	4	3
19	5250	139.3	127.7	2.32	111.5	102.2	1.86	92.9	85.2	1.55		
20	5300	137.2	125.8	2.18	109.7	100.6	1.75	91.4	83.8	1.45		
22	5450	134.5	123.3	1.94	107.6	98.6	1.55	89.7	82.2	1.29		
24	5600	132.2	121.2	1.75	105.8	97.0	1.40	88.2	80.9	1.17		
26	5700	129.4	118.6	1.58	103.5	94.9	1.26	86.2	79.0	1.05	3½	2½
28	5800	127.0	116.4	1.44	161.5	93.0	1.15	84.6	77.6	0.96		
30	5900	124.7	114.3	1.31	99.8	91.5	1.05	83.1	76.2	0.87		
32	5950	121.8	111.7	1.21	97.4	89.3	0.97	81.2	74.4	0.81		
34	6000	119.1	109.2	1.12	95.2	87.3	0.90	79.4	72.8	0.75		
36	6050	116.7	107.0	1.03	93.4	85.6	0.82	77.8	71.3	0.69	3	2
38	6100	114.5	105.0	0.96	91.6	84.0	0.77	76.4	70.0	0.64		
40	6100	111.6	102.3	0.89	89.3	81.9	0.71	74.4	68.2	0.60		
50	6450	105.6	96.8	0.67	84.5	77.5	0.54	70.4	64.5	0.45	2¾	1¾
60	6750	100.9	92.5	0.54	80.7	74.0	0.43	67.2	61.6	0.36		
70	6900	95.4	87.5	0.44	76.4	70.0	0.35	63.6	58.3	0.29		

Allowance has been made for waste, cleaning, oiling and doffing.

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—5 Ply.

No. of Yarn to be Twisted.	Rev. of Spindle per Minute.	Multiplier 4.			Multiplier 5.			Multiplier 6.			Space of Frame in Inches	Dia. of Ring in Inches
		Rev. per Min.		Pounds per Spindle.	Rev. per Min.		Pounds per Spindle.	Rev. per Min.		Pounds per Spindle		
		1⅜"Roll	1½"Roll		1⅜"Roll	1½"Roll		1⅜"Roll	1½"Roll			
6	2800	148.0	135.7	9.77	118.3	108.4	7.81	98.7	90.5	6.52	5½	4½
7	3000	146.8	134.6	8.31	117.3	107.5	6.64	97.8	89.7	5.54		
8	3150	144.1	132.1	7.13	115.4	105.8	5.71	96.1	88.1	4.75		
9	3300	142.2	130.4	6.26	113.8	104.3	5.01	94.9	87.0	4.17		
10	3400	139.1	127.5	5.51	111.3	102.0	4.41	92.7	85.0	3.67	5	4
11	3550	138.6	127.1	4.99	110.8	101.6	3.99	92.4	84.7	3.33		
12	3650	136.3	124.9	4.50	109.0	99.9	3.60	90.8	83.2	3.00		
13	3750	134.6	123.4	4.10	107.7	98.7	3.29	89.8	82.3	2.73		
14	3800	131.5	120.5	3.72	105.1	96.3	2.98	87.6	80.3	2.48		
15	3900	130.3	119.4	3.44	104.3	95.6	2.75	86.8	79.6	2.29		
16	3950	127.7	117.1	3.16	102.2	93.7	2.53	85.2	78.1	2.11		
17	4000	125.5	115.0	2.93	100.4	92.0	2.34	83.7	76.7	1.95		
18	4050	123.5	113.2	2.72	98.8	90.6	2.18	82.4	75.5	1.81		
19	4100	121.7	111.6	2.54	97.3	89.2	2.03	81.1	74.3	1.70		
20	4150	120.1	110.1	2.38	96.1	88.1	1.90	80.1	73.4	1.59	4½	3½
22	4200	116.2	106.5	2.09	92.7	85.0	1.67	77.2	70.8	1.39		
24	4300	113.6	104.1	1.88	90.9	83.3	1.50	75.7	69.4	1.25		
26	4350	110.4	101.2	1.68	88.3	80.9	1.34	73.6	67.5	1.12		
28	4400	107.6	98.6	1.52	86.1	78.9	1.22	71.7	65.6	1.01		
30	4500	106.3	97.4	1.41	85.1	78.0	1.13	70.9	65.0	0.94		
32	4550	104.1	95.4	1.29	83.3	76.4	1.03	69.4	63.6	0.86		
34	4600	102.1	93.6	1.19	81.7	74.9	0.95	68.0	62.3	0.79		
36	4600	99.2	90.9	1.09	79.4	72.8	0.87	66.1	60.6	0.73	4	3
38	4600	96.6	88.7	1.01	77.3	70.9	0.81	64.4	59.0	0.67		
40	4600	94.1	86.3	0.93	75.3	69.0	0.74	62.7	57.5	0.62		
50	4900	89.7	82.2	0.72	71.7	65.7	0.58	59.8	54.8	0.48		
60	5200	86.8	79.6	0.58	69.5	63.7	0.46	57.9	53.1	0.39	3½	2½
70	5450	84.3	77.3	0.48	67.4	61.8	0.38	56.2	51.5	0.32		

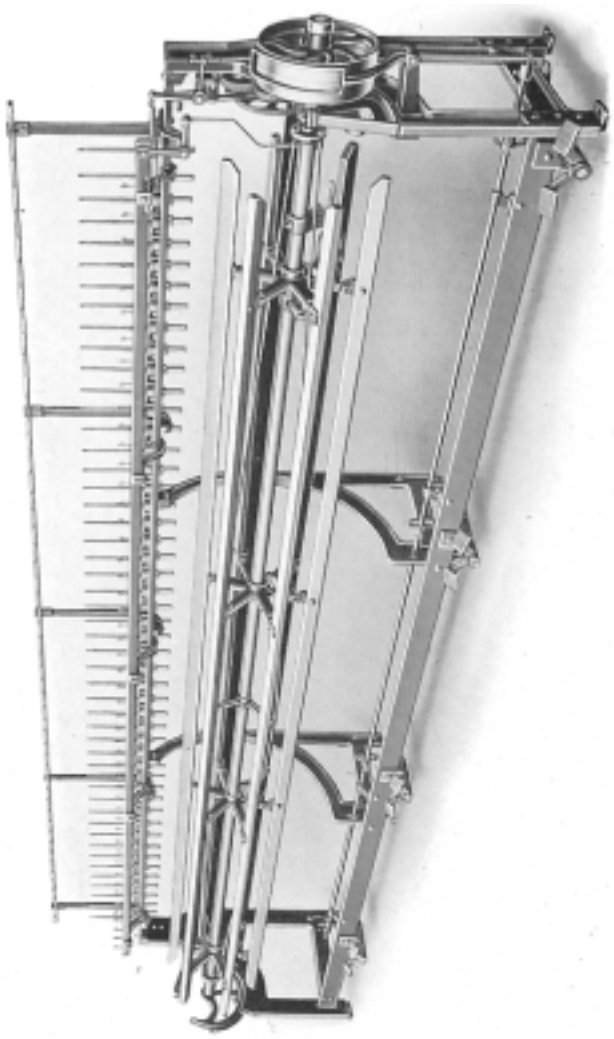
Allowance has been made for waste, cleaning, oiling and doffing.

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—6 Ply.

No of Yarn to be Twisted.	Rev. of Spindle per Minute.	Multiplier 4.			Multiplier 5.			Multiplier 6.			Space of Frame in Inches	Dia. of Ring in Inches
		Rev. per Min.		Pounds per Spindle.	Rev. per Min.		Pounds per Spindle.	Rev. per Min.		Pounds per Spindle.		
		1⅜"Roll	1½"Roll		1⅜"Roll	1½"Roll		1⅜"Roll	1½"Roll			
6	2400	138.9	127.3	11.00	111.1	101.8	8.80	92.6	84.9	7.34	5½	4½
7	2550	136.7	125.3	9.28	109.3	100.2	7.42	91.1	83.5	6.19		
8	2700	135.3	124.0	8.04	108.4	99.4	6.44	90.2	82.7	5.36		
9	2850	134.6	123.4	7.13	107.8	98.8	5.70	89.8	82.3	4.75		
10	2950	132.3	121.3	6.29	105.9	97.1	5.03	88.1	80.8	4.19	5	4
11	3050	130.3	119.4	5.64	104.3	95.6	4.51	86.9	79.7	3.76		
12	3150	128.8	118.1	5.10	103.1	94.5	4.08	85.9	78.7	3.40		
13	3250	127.7	117.6	4.68	102.2	93.7	3.74	85.2	78.1	3.12		
14	3350	126.9	116.3	4.31	101.5	93.0	3.45	84.6	77.6	2.88		
15	3450	126.4	115.9	4.00	101.0	92.6	3.20	84.2	77.2	2.67		
16	3550	125.8	115.3	3.74	100.7	92.3	2.99	83.9	76.9	2.49		
17	3600	123.8	113.5	3.46	99.0	90.8	2.77	82.5	75.6	2.31		
18	3650	121.9	111.7	3.23	97.6	89.5	2.58	81.3	74.5	2.15		
19	3700	120.3	110.3	3.01	96.2	88.2	2.41	80.2	73.5	2.01		
20	3750	118.9	109.0	2.83	95.1	87.2	2.26	79.3	72.7	1.88	4½	3½
22	3850	116.3	106.6	2.51	93.1	85.3	2.01	77.6	71.1	1.68		
24	4000	115.7	106.1	2.30	92.6	84.9	1.84	77.2	70.8	1.53		
26	4050	112.5	103.1	2.06	90.1	82.6	1.05	75.1	68.8	1.38		
28	4100	109.8	100.6	1.86	87.9	80.6	1.49	73.2	67.1	1.24		
30	4150	107.4	98.5	1.70	85.9	78.7	1.36	71.6	65.6	1.13	4	3
32	4200	105.2	96.4	1.56	84.2	77.2	1.25	70.1	64.3	1.04		
34	4200	102.1	93.6	1.43	81.7	74.9	1.14	68.1	62.4	0.95		
36	4250	100.4	92.0	1.32	80.3	73.6	1.06	66.9	61.3	0.88		
38	4250	97.7	89.6	1.23	78.2	71.7	0.98	65.2	59.8	0 82	3½	2½
40	4250	93.4	85.6	1.14	76.2	69.9	0.91	63.5	58.2	0.76		
50	4550	91.2	83.6	0.87	73.0	66.9	0.70	60.8	55.7	0.58		
60	4750	86.9	79.7	0.70	69.5	63.7	0.56	58.0	53.2	0.47		
70	4950	83.9	76.9	0.58	67.1	61.5	0.46	55.9	51.2	0.38	3	2

Allowance has been made for waste, cleaning, oiling and doffing.

REELING



Improved Reel

THE IMPROVED REEL

This machine is simple in design, well built and light running. The heaviest yarns can be reeled with practically no vibrations to the machine, owing to its rigid construction, and the perfect balancing of the swift. The wheel method of doffing is used, either plain or cross traverse may be had, also stop mechanism to stop the Reel when any desired length of skein has been reeled from 120 yards to 840 yards.

All risk of soiling the yarn while being doffed is eliminated by the use of our Patented oiling arrangement, applied to doffing wheel.

The Spindles are usually made with a uniform friction, but an adjustable friction spindle may be had, if preferred.

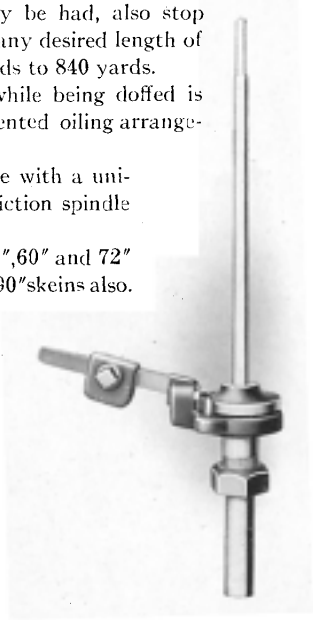
The Swift is adjustable for 54″,60″ and 72″ skeins,and can be arranged to wind 90″skeins also.

Driving Pulleys: 12 inches diameter by 2-inch face, running from 100 to 150 revolutions per minute, according to the size of skein and strength of yarn.

Horse Power: 300 spindles per horse power.

Floor Space: Width, 2 feet, 2 inches; length according to the number of spindles and space as per table of floor space.

Weights: Shipping weight, 90 pounds per foot; net weight, 60 pounds per foot.

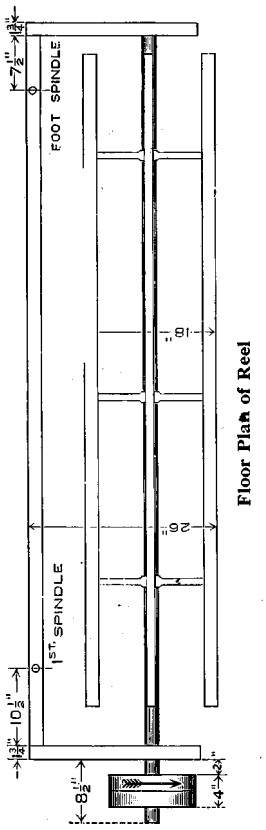


Reel Spindle

SPECIFICATION FOR REELS

How many **Reels**?
Heavy Pattern, or Light Running?
How many Spindles each?
What Space between Spindles?
What size of Skein?
Standard or Cross Traverse?
Will you Reel from Spinning Bobbins?
Will you Reel from Twister Bobbins?
Driving Pulleys are 12″ Dia. x 2″ Face.
Belt from Above or Below?
Right or Left Hand?

NOTE:—Mail us sample of **each style of Bobbin** you will reel from.



Floor Plan of Reel

Reel

FLOOR SPACE

No. of Spindles	2¾ in. Space.		3 in. Space.		3¼ in. Space.		3½ in. Space.		3¾ in. Space.		4 in. Space.		No. of Spindles
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in	ft.	in.	
30									11	6¾	12	2	30
32							11	6½	12	2¼	12	10	32
34					11	5¼	12	1½	12	9¾	13	6	34
36			11	3	11	11¾	12	8½	13	5¼	14	2	36
38			11	9	12	6¼	13	3½	14	0¾	14	10	38
40	11	5¼	12	3	13	0¾	13	10½	14	8¼	15	6	40
42	11	10¾	12	9	13	7¼	14	5½	15	3¾	16	2	42
44	12	4¼	13	3	14	1¾	15	0½	15	11¼			44
46	12	9¾	13	9	14	8¼	15	7½					46
48	13	3¼	14	3	15	2¾	16	2½					48
50	13	8¾	14	9	15	9¼							50
52	14	2¼	15	3	16	3¾							52
54	14	7¾	15	9									54
56	15	1¼	16	3									56
58	15	6¾											58
60	16	0¼											60

Reel Production Tables.

No. Yarn.	54 IN. REEL. Revolutions per Minute. 125	130	135	140	145	150	60 IN. REEL. Revolutions per Minute. 120	125	130	135	140	145	No. Yarn.
1	50.22	52.24	54.24	56.25	58.26	60.27	53.57	55.81	58.04	60.27	62.50	64.74	1
2	25.11	26.12	27.12	28.12	29.13	30.14	26.79	27.91	29.02	30.14	31.25	32.37	2
3	16.74	17.41	18.08	18.75	19.42	20.09	17.86	18.60	19.35	20.09	20.84	21.58	3
4	12.55	13.06	13.56	14.07	14.57	15.07	13.40	13.95	14.51	15.07	15.62	16.18	4
5	10.04	10.45	10.85	11.25	11.65	12.06	10.72	11.16	11.61	12.06	12.50	12.95	5
6	8.37	8.71	9.03	9.38	9.71	10.05	8.93	9.30	9.67	10.05	10.42	10.79	6
7	7.17	7.46	7.75	8.04	8.33	8.61	7.66	7.97	8.29	8.61	8.93	9.25	7
8	6.28	6.53	6.78	7.04	7.28	7.54	6.70	6.98	7.26	7.54	7.82	8.09	8
9	5.58	5.81	6.03	6.25	6.48	6.70	5.95	6.20	6.45	6.70	6.95	7.20	9
10	5.02	5.23	5.43	5.63	5.83	6.03	5.36	5.58	5.81	6.03	6.25	6.48	10
11	4.56	4.75	4.93	5.12	5.30	5.48	4.87	5.08	5.28	5.48	5.64	5.89	11
12	4.18	4.36	4.52	4.69	4.86	5.02	4.46	4.65	4.84	5.02	5.21	5.40	12
13	3.86	4.02	4.17	4.33	4.48	4.64	4.12	4.29	4.47	4 64	4.81	4.98	13
14	3.58	3.73	3.88	4.02	4.16	4.30	3.83	3.99	4.15	4.31	4.47	4.63	14
15	3.34	3.48	3.62	3.75	3.89	4.02	3.57	3.72	3.87	4.02	4.17	4.32	15
16	3.14	3.27	3.39	3.52	3.64	3.77	3.35	3.49	3.63	3.77	3.91	4.05	16
17	2.95	3.08	3.20	3.31	3.43	3.55	3.15	3.29	3.42	3.55	3.68	3.81	17
18	2.79	2.90	3.02	3.13	3.24	3.35	2.98	3.10	3.23	3.35	3.47	3.59	18
19	2.65	2.75	2.85	2.96	3.07	3.17	2.82	2.99	3.06	3.17	3.29	3.41	19
20	2.51	2.61	2.70	2.82	2.92	3.02	2.68	2.79	2.90	3.02	3.13	3.24	20
21	2.40	2.49	2.58	2.68	2.78	2.87	2.55	2.66	2.77	2.87	2.98	3.08	21
22	2.28	2.38	2.47	2.56	2.65	2.74	2.44	2.54	2.64	2.74	2.84	2.95	22
23	2.19	2.27	2.36	2.45	2.54	2.62	2.33	2.43	2.53	2.62	2.72	2.82	23
24	2.10	2.18	2.26	2.35	2.43	2.51	2.24	2.33	2.42	2.51	2.61	2.69	24
25	2.01	2.09	2.17	2.25	2.33	2.41	2.15	2.23	2.32	2.41	2.50	2.59	25
26	1.93	2.01	2.09	2.17	2.24	2.32	2.06	2.15	2.23	2.32	2.41	2.49	26
27	1.86	1.94	2.01	2.09	2.16	2.23	1.99	2.07	2.15	2.23	2.32	2.40	27
28	1.80	1.87	1.94	2.01	2.08	2.15	1.92	2.00	2.08	2.15	2.23	2.31	28
29	1.73	1.80	1.87	1.94	2.01	2.08	1.85	1.93	2.00	2.08	2.16	2.23	29
30	1.68	1.74	1.81	1.88	1.94	2.01	1.79	1.86	1.94	2.01	2.09	2.16	30

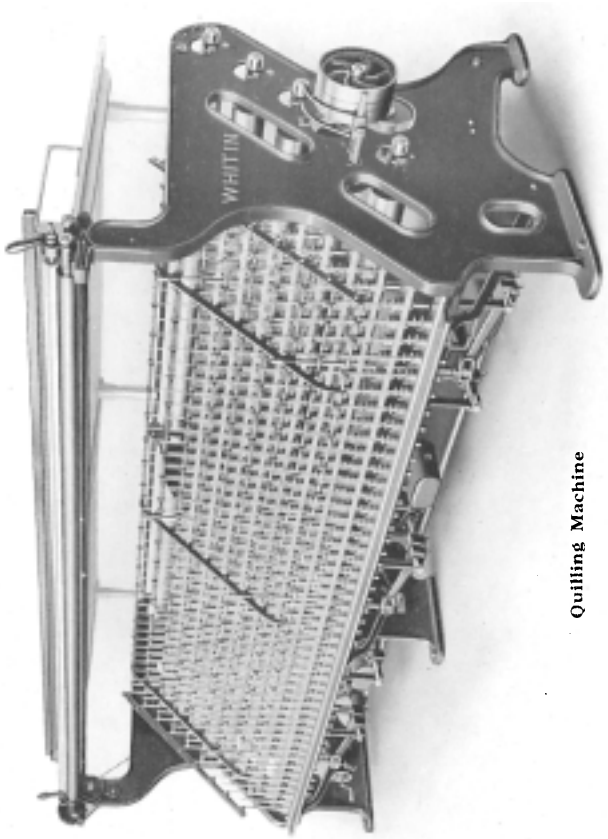
NOTE:—Result in pounds per spindle per day. Allowance is made in above table for doffing, etc.

Reel Production Tables. Continued.

72 IN. REEL. Revolutions per Minute.							90 IN. REEL. Revolutions per Minute.						
No. Yarn.	110	115	120	125	130	135	100	105	110	115	120	125	No. Yarn.
1	58.93	61.61	64.29	66.97	69.65	72.33	66.97	70.31	73.66	77.01	80.36	83.71	1
2	29.47	30.81	32.15	33.49	34.83	36.16	33.49	35.16	36.83	38.51	40.18	41.86	2
3	19.65	20.54	21.43	22.33	23.22	24.11	22.32	23.44	24.56	25.67	26.78	27.90	3
4	14.74	15.40	16.07	16.74	17.41	18.08	16.74	17.58	18.42	19.26	20.09	20.93	4
5	11.79	12.32	12.86	13.40	13.93	14.47	13.40	14.06	14.73	15.40	16.07	16.74	5
6	9.82	10.27	10.72	11.16	11.61	12.05	11.16	11.72	12.33	12.84	13.40	13.95	6
7	8.42	8.73	9.19	9.57	9.95	10.33	9.57	10.05	10.53	11.00	11.48	11.96	7
8	7.37	7.70	8.04	8.37	8.71	9.04	8.37	8.79	9.21	9.63	10.05	10.47	8
9	6.55	6.85	7.15	7.44	7.74	8.04	7.44	7.81	8.19	8.56	8.93	9.30	9
10	5.90	6.16	6.43	6.70	6.97	7.23	6.70	7.03	7.37	7.70	8.04	8.37	10
11	5.36	5.60	5.85	6.09	6.33	6.58	6.09	6.39	6.70	7.00	7.31	7.61	11
12	4.91	5.14	5.36	5.58	5.81	6.03	5.58	5.86	6.14	6.42	6.70	6.98	12
13	4.54	4.74	4.95	5.15	5.36	5.57	5.15	5.41	5.66	5.93	6.18	6.44	13
14	4.21	4.40	4.59	4.79	4.97	5.17	4.79	5.03	5.26	5.50	5.74	5.98	14
15	3.93	4.11	4.29	4.47	4.64	4.82	4.47	4.69	4.91	5.14	5.36	5.58	15
16	3.69	3.85	4.02	4.19	4.36	4.52	4.19	4.40	4.61	4.82	5.02	5.23	16
17	3.47	3.63	3.78	3.94	4.20	4.26	3.94	4.14	4.34	4.53	4.73	4.93	17
18	3.28	3.43	3.57	3.72	3.87	4.02	3.72	3.91	4.09	4.28	4.47	4.65	18
19	3.10	3.24	3.39	3.53	3.67	3.81	3.53	3.70	3.88	4.05	4.23	4.41	19
20	2.95	3.08	3.22	3.35	3.49	3.62	3.35	3.52	3.69	3.85	4.02	4.19	20
21	2.81	2.94	3.06	3.19	3.32	3.45	3.19	3.35	3.51	3.67	3.83	3.99	21
22	2.68	2.80	2.92	3.05	3.17	3.29	3.05	3.20	3.35	3.50	3.66	3.81	22
23	2.56	2.68	2.80	2.91	3.03	3.15	2.91	3.06	3.21	3.35	3.50	3.64	23
24	2.46	2.57	2.68	2.79	2.90	3.02	2.79	2.93	3.07	3.21	3.35	3.49	24
25	2.36	2.47	2.57	2.68	2.79	2.90	2.68	2.81	2.95	3.08	3.22	3.35	25
26	2.27	2.37	2.47	2.58	2.68	2.78	2.58	2.71	2.84	2.96	3.09	3.22	26
27	2.19	2.28	2.38	2.48	2.58	2.68	2.48	2.61	2.73	2.85	2.98	3.10	27
28	2.11	2.20	2.30	2.39	2.49	2.58	2.39	2.51	2.63	2.75	2.87	2.99	28
29	2.03	2.13	2.22	2.31	2.40	2.50	2.31	2·43	2.54	2.66	2.77	2.89	29
30	1.97	2.06	2.15	2.23	2.32	2.41	2.23	2.35	2.46	2.57	2.68	2.79	30

NOTE:—Result in pounds per spindle per day. Allowance is made in above table for doffing, etc.

QUILLING



Quilling Machine

THE LONG-CHAIN QUILLING MACHINE

This machine has merited recognition as an important factor in the field of textile manufacturing. Through years of development and service, it has demonstrated its merit and adaptability to classes of work for which the ordinary skein process of quilling cannot be advantageously employed. It has further proven its efficiency and economy in quilling satisfactorily, all sizes of colored, bleached and mercerized yarns, also single or double yarns for braiders.

The machine is manufactured with the best of tools and equipment, by skilled workmen and under efficient management. The excellence of its design is therefore supplemented by the highest grade of workmanship, while all materials used in its construction are carefully selected and of the best quality.

Since the introduction of our **Quilling Machine** to the textile industry, the long-chain process of finishing yarns has come into almost universal use in velvet, plush, bleached, colored and mercerized yarn mills. This process, in comparison with the methods still in use in some mills, of winding from a short skein, has a number of essential points in its favor, among which may be mentioned:

First: The labor expense of preparing the yarn for bleaching, dyeing or mercerizing is greatly reduced.

Second. The yarn dyed in a long-chain takes a more even shade, showing more lustre and bloom than in the skein process.

Third. The yarn is wound direct from the chain onto bobbin or quill, ready for braiding or weaving without any intermediate process.

Fourth. The avoidance of burnt or burnished yarn, whereby the strength as well as the original brightness and clearness of the yarn is fully maintained.

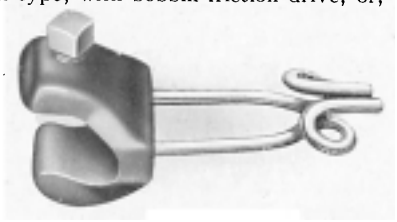
Fifth. There is practically no waste in winding, and substantial savings are made in the cost of production, floor space occupied, and power consumed.

Sixth. The trouble due to "double filling" on re-wound bobbins is to a great extent eliminated. Should a "double" occur on our machine, the quill or bobbin will build a correspondingly larger diameter, rendering it impossible to place the bobbin in the shuttle. In the skein winder a "double" does not alter the appearance of the bobbin, and the weaver, not noticing the defect, places the bobbin in the shuttle, with a result of a "pick-out" in the cloth, and the consequent loss of the weaver's time and the impairment to the quality of the cloth being woven.

Common Spindle

Seventh. Lapped ends cannot be made, consequently bobbins wound on this machine will weave or unwind from start to finish without break of yarn, and also without leaving any waste on the bobbin.

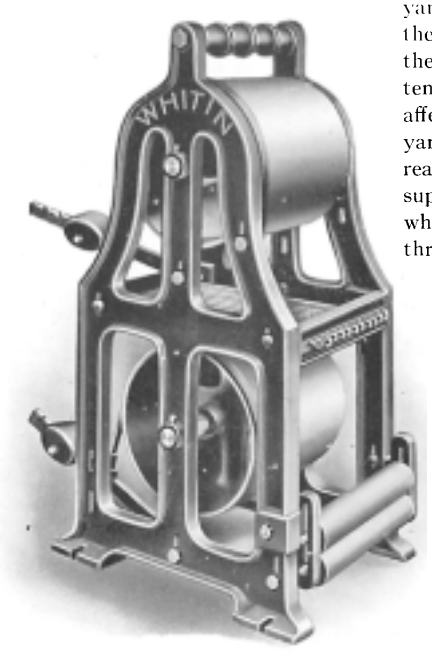
The Whitin Quilling Machine is a rigidly constructed frame, consisting of two end standards connected together by bolster rails and tie rods, supported by one or more intermediate sampsons. The bolster or spindle rails are arranged in either 5, 6 or 9 tiers, each tier being fitted with from 25 to 42 spindles, according to model of frame. **The Spindles,** which are driven by hands from cylinders in back of frame, may be either our common positively driven type, with bobbin friction drive, or, if preferred, the Holt and Seeley patented spindle which we have recently adopted. The former is best adapted for the coarser counts of yarn, whose strength would not be materially affected by the increasing tension due to the



Guide

Holt Patent Spindle

increasing weight of yarn in winding from empty to full bobbin. With this type of spindle the bobbin is supported on a loose collar which is frictionally driven from the spindle by means of a friction washer of flannel or felt interposed between the collar and top of spindle whirl. The amount of tension imparted depends on the weights and sizes of washer and collar, and also the weight of the yarn on bobbin. Owing to the peculiar construction of the **Holt spindle,** the tension of the yarn is not affected by the weight of yarn on bobbin, for the reason that the bobbin is supported by the spindle, which is frictionally driven through a tension collar and a felt or flannel washer by a whirl loosely mounted on the bolster casing. By this construction a constant, predetermined tension is imparted to the yarn, irrespective of the weight of the bobbin, thus rendering this spindle particularly adapted for winding fine, delicate yarns. The spindles are made to order to fit bobbins suitable for the work required.



Friction Drums

In front of each tier of spindles is a guide wire rod holding guide wires of hardened steel for each spindle. The rods are supported by inclined bars fastened to the lifting rods of the **builder motion,** which controls the length of traverse and style of wind on the bobbins. This motion is so designed that bobbins may be made for filling wind, warp wind, long straight wind, long wind with taper

top, or long wind reversed. The motion has a quick return, which securely binds the yarn on the bobbin, thereby forming a very solid and compact bobbin, suitable for subsequent processes.

The Shipping Motion is operated by the foot of the operative leaving both hands free for vibrating the reed to separate stuck ends as they come along in the chain of yarn.

The machine has no complicated mechanisms, one operative easily tending a machine of 378 spindles.

In operation, the chain of yarn to be quilled is drawn from a turntable over friction bars to friction drums, stationed about thirty feet from the frame, which allows sufficient spread to the yarn, and also gives the operative an opportunity to readily detect a lease or broken end as it is being drawn up, when the machine may be stopped to remedy the defect. The yarn passes through the suspended reed, to which the operative occasionally gives a backward and forward motion for the purpose of separating the ends that may be stuck together, thus preventing breakage of the yarn. From the reed the yarn is drawn under a cloth-covered friction roll, which also serves to catch loose ends. Thence the yarn passes to the guide wires, and is wound upon the bobbins.

Previous to doffing the bobbins the yarn is depressed by the operative by means of the **doffing mechanism** (patent pending) to a position below the upper flange of the bobbin collars, and then a few coils of yarn are wound thereon, for the purpose of holding the ends preparatory to starting a new set of bobbins. From time to time the waste yarn collecting on this collar can be readily removed by cutting with a knife along the groove in collar provided for this purpose.

The Pulleys are 10 inches in diameter by 2 inches face; speed 300 to 380 revolutions per minute.

Horse Power: 378 spindles, $2\frac{1}{2}$ inch space machine, consumes about 2 horse power at 320 revolutions per minute of pulley.

To suit the varied requirements of the trade in the matter of sizes and styles of bobbins to be quilled, our machines are made in **six models,** as follows:

Model	Space	Number of Spindles	Length Overall
A	$2\frac{1}{2}$ in.	378	10 ft., 10 in.
F	3 in.	378	12 ft., 7 in.
E	$3\frac{5}{8}$ in.	192	11 ft., $8\frac{1}{2}$ in.
B	$4\frac{1}{2}$ in.	125	10 ft., 10 in.
C	$4\frac{3}{4}$ in.	190	17 ft., $1\frac{1}{2}$ in.
D	5 in.	150	14 ft., 9 in.

For width, see floor plan on page 173.

In regard to the **production table,** given herewith, we have been governed entirely by the results reported by the various mills using these machines. We have found more or less divergence in the results obtained, owing to the particular conditions and processes under which each mill works up its product. However, for purposes of comparison, we have averaged all the results together for the reason that in the same mill we have found little difference in production on the same actual number, whether the yarn was in the gray, mercerized, colored, bleached or in ply.

In the last column we have given a proportionate list of productions which would seem fair under the best conditions. We would caution mills, however, in making comparison with these estimated figures, as a number of conditions arise which would limit their production, among which we might mention:—

1. Expertness of help.
2. The condition, length and strength of the warps as delivered to the Quilling Machine.
3. If dyed, the color of the warp.
4. The size and traverse of the quill.

In brief, this table is only approximate, but, as such, we believe has value, if taken and considered in reference to the particular conditions of each mill.

SPECIFICATIONS FOR LONG-CHAIN QUILLING MACHINES

How many **Long-Chain Quilling Machines**?
How many Spindles each?
Diameter of Whorl?
Space between Spindles?
How many Friction Drums?
How many Reeds?
How many Turntables?
Driving Pulleys are 10″ x 2″.
Belt from Above or Below?
Warp or Filling Wind?
Traverse?
State number of Yarn to be quilled.
Diameter of Felt Washers?

NOTE:—**Long-Chain Quilling Machines** are regularly built 378 Spindles each, $1\frac{5}{16}$″ Whorl, $2\frac{1}{2}$″ or 3″ space, Cylinders 5″ Diameter and are built right hand only.

EXTRAS

The standard machine includes regular pipe roll, which is painted and flannel-covered, and standard quiller spindle.

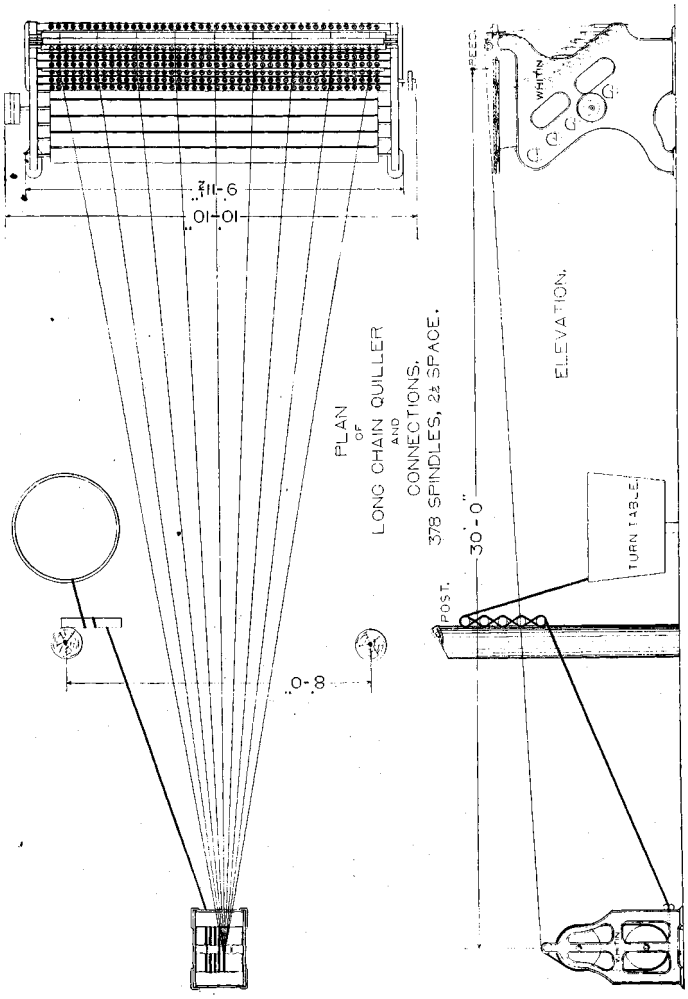
Holt-Seeley Spindles—Small Size.
" " " Medium Size.
" " " Large Size.
Friction Drums.
Reeds.
Turntables.
Oil Guards on Spindle Rails.
Lease Rods and Stands.
Porcelain Thread Guides.
Enameled Thread Guides.
Rubber Roll, instead of regular pipe roll.
Bottle Wind with mangle wheel arrangement.

The Quiller is regularly shipped skidded on its feet without extra charge, and delivered f. o. b. cars Whitins. When knocked down and boxed there is an extra charge of 5% of machine's value.

PRODUCTION TABLE

NUMBER OF POUNDS QUILLING PER DAY OF TEN HOURS
378 SPINDLE MACHINE.

Number of yarn	Highest lbs.	Lowest lbs.	Averages obtained lbs.	A Fair Average lbs.
5's	370	275	305	400
6's	400	400	400	400
7's	300	300	300	400
8's	450	300	375	400
9's	391	391	394	400
10's	550	225	398	400
11's	409	344	377	375
12's	410	273	317	350
13's	333	180	260	325
14's	400	225	300	300
15's	425	170	286	280
16's	360	165	263	270
17's	260	246	253	260
18's	300	225	255	255
20's	330	110	236	250
22's	230	210	220	230
24's	200	125	163	210
25's	280	216	249	200
26's	190	138	169	190
27's	140	140	140	180
28's	120	112	116	170
30's	240	110	158	155
32's	150	150	150	150
33's	155	155	155	145
35's	180	118	149	140
36's	140	115	126	135
38's	130	120	125	125
40's	120	112	116	115
45's	110	100	105	105
50's	100	76	88	90
60's	80	80	80	80
65's	75	70	72	75
70's	70	50	60	60
80's	60	40	50	50


11-6
10-10
0-8
PLAN
OF
LONG CHAIN QUILLER
AND
CONNECTIONS,
378 SPINDLES, 2¼ SPACE.
ELEVATION.
30'-0"
POST.
TURN TABLE
FEED
WHITIN

WEAVING

GENERAL DESCRIPTION OF WHITIN LOOMS

In designing these machines, careful attention has been given to securing rigidity, together with extreme accuracy as well as convenience of operations. Realizing the necessity of reducing the vibrations in the machines to a minimum, the metal in the **Frames** is distributed in proportion to the strength required and strains imposed. The girts and breast beams are preferably made of wood of large cross sections which prevents any undue vibrations, and at the same time allows an element of flexibility to exist which experienced weavers consider essential for the production of faultless goods.

The Lathes are made of the best of seasoned lumber and are fitted with either wood or iron race plates as preferred. The swords, of iron or wood, are supported in pockets held on a shaft journalled in bearings bolted to the loom sides. The reed cap is of hard wood and is fitted with an efficient shuttle guard.

The Shuttle Boxes, of either iron or wood, are made in several different styles to suit the varying conditions demanded by manufacturers. The shuttle boxes may be fitted with either front or back binders as preferred.

The Picking Motion is so designed as to give an easy pick on all kinds of weaves. The cams are provided with detachable chilled points which ensures long life to the cams. The pick shafts are of rugged design journalled in chilled cast-iron bearings firmly bolted to the loom sides. The well known Stearns' picker stick motion is applied unless otherwise ordered.

The Protecting Motion is of rugged design and is made to protect at both sides or in centre of lathe as ordered.

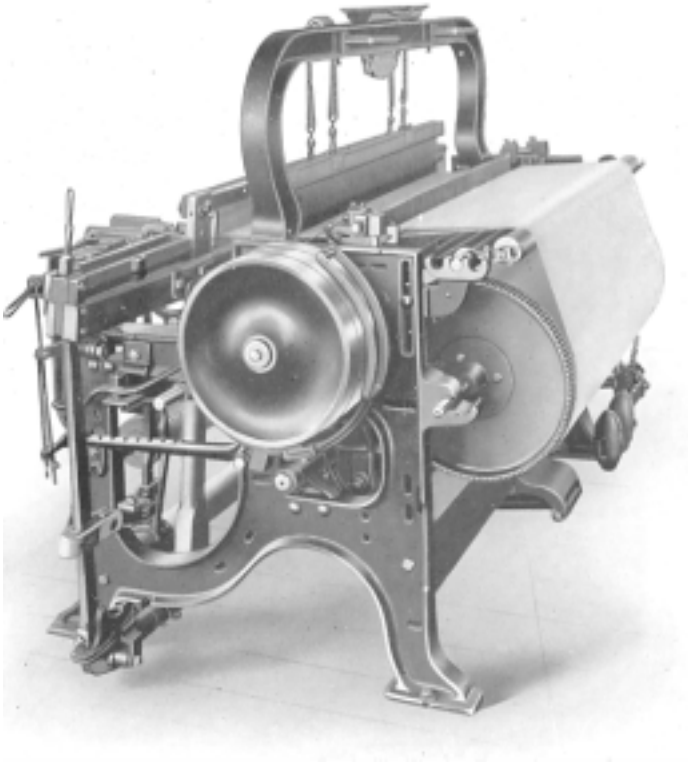
The Let-off Motion may be either the Bartlett or friction let-off, or a combination of both, but in addition to these we have several other styles of let-off motions that are applied when ordered. The whip rolls are made in various weights and sizes, either fixed, vibrating or revolving. The whip-roll stands are readily adjusted to obtain the proper height of the yarn to give a satisfactory face on the cloth being woven.

The Take-up Motions are made in several different styles, winding the cloth into rolls from 8 inches to 22 inches in diameter, as ordered. The take-up roll may be covered with sand paper, perforated tin or steel filleting as desired. The pick gearing is generally arranged to make two picks for each tooth in the change gear, but to answer the requirements of manufacturers who may desire a different combination, we have other arrangements, details of which will be furnished on application.

The Harness Motions are so designed that the motion of the harnesses is free from jar, and consequently the warp is not subjected to any uneven strains. The cams are drawn out with mathematical precision, allowing proper time for the opening and closing of the shed for different widths of cloth and sizes of shuttles. Unless otherwise ordered our plain looms are made for 2 harness work, but they can be readily arranged for 3, 4, 5 and 6 harness satin or twill weaves, also combination weaves, the cams being set for any of the combinations desired. To facilitate the changing from one weave to another, our looms may be equipped with a short auxiliary cam shaft on which the cams are fixed, but are easily removable for any required change. Weavers who have been called upon to make changes in twill work can readily appreciate the advantages of this construction.

We have two **Selvage Motions**, the plain, and the tape styles. They are simple in construction and efficient in their action.

Our Standard Warp Beam is $16\frac{1}{2}$ inches in diameter, but we can furnish looms equipped for any size beam from 12 inches to 20 inches diameter, either for gear or friction let-offs. **The Owen** Beam Lock is furnished when desired. By the use of this device the beam is held securely in its bearings with no possibility of it



Sheeting Loom with Warp Stop-Motion

getting loose, but when desired the beam is easily unlocked by a simple twist of the hand, requiring neither hammer nor wrench, as in old methods.

Filling Stop-Motions are furnished with all looms, any style of fork being fitted as ordered.

Beam Lock

Our Improved Warp-Stop Motion, supplied when specified, is a decided improvement over our old style, both in its simplicity, and also its adaptability to old as well as new looms. The construction is so designed as to combine strength and rigidity with lightness, thus reducing breakage to a minimum, and at the same time rendering the mechanism not too cumbersome in its application to the loom.

The motion can be used with any number of harnesses, there being a detector or drop for each thread. In case of a breakage of a thread its detector falls into the path of the vibrating feeler, whose motion is thus arrested, resulting by means of a suitable connection with the loom shipping mechanism in stopping the loom.

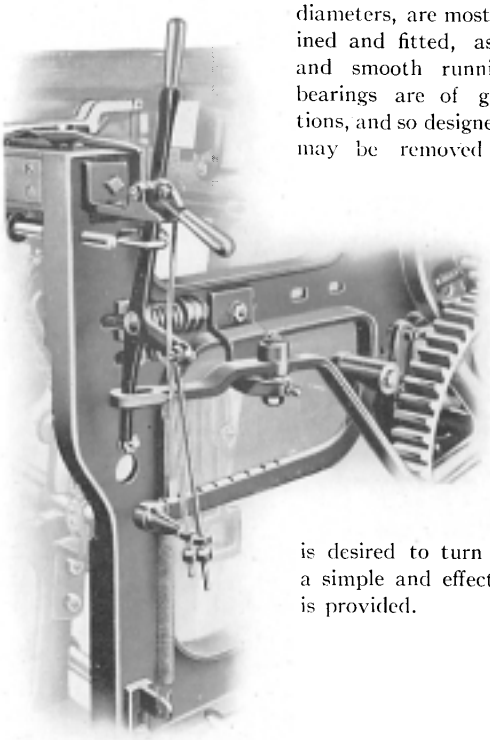
Owing to the extreme lightness and superior finish of the detectors used in this motion, chafing of the yarn is reduced to a minimum.

The Driving Pulleys may be either the "tight and loose" style, plain, compounded or friction as preferred. To render the friction drive more positive, cork "inserts" may be used.

The Driving Gearing on crank and cam shafts may be placed at either the pulley or foot ends as desired. They are of large pitch and broad face thus ensuring strength and maximum freedom from wear.

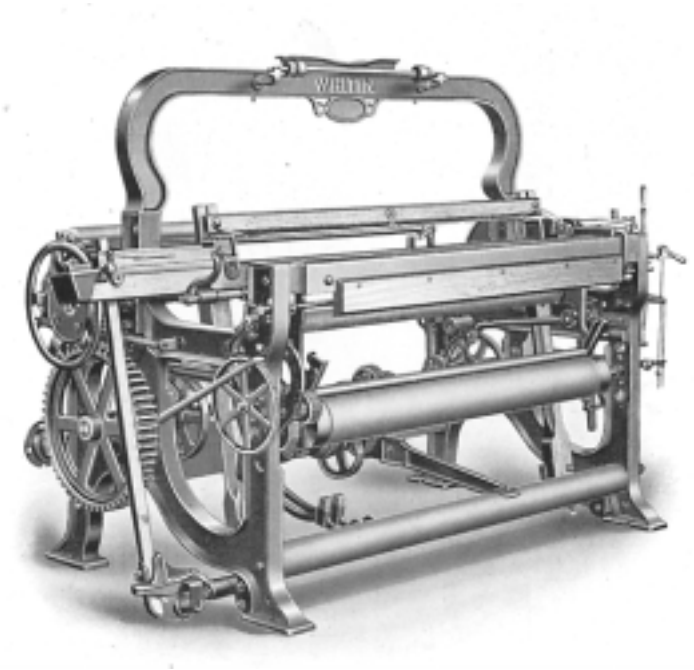
The Crank Shafts are dropped forgings of the best of material. This, together with the cam shafts, which have especially large

diameters, are most carefully machined and fitted, assuring long life and smooth running. The shaft bearings are of generous proportions, and so designed that the shafts may be removed with the least amount of labor.



Brake Relief

A Brake mechanism actuated from the shipping lever is applied to all looms. For the convenience of the weaver, whenever it is desired to turn back the loom, a simple and effective brake relief is provided.



Heavy Pattern Loom

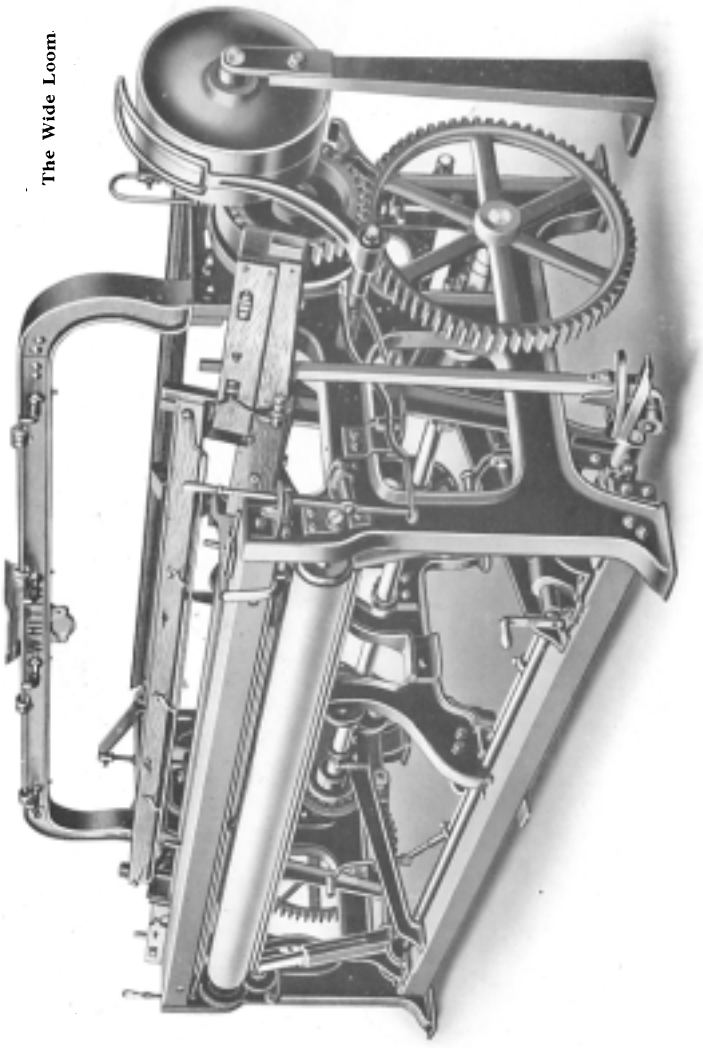
HEAVY PATTERN LOOM

Designed for Standard Sheetings, Shirtings, Drills, Twills, etc.

This loom is made in two sizes, viz.: Standard and Ponemah. The latter has three inches greater harness space. The framing of this style of loom is very heavy, and is admirably adapted for the high speeds and large production demanded in weaving the class of goods for which the loom is designed. When desired, this loom is made with an adjustable arch, by means of which extra harness space may be obtained.

As will be seen from the illustration, this loom is regularly fitted with our standard **Cam Harness Motion,** which may be readily arranged for 2, 3, 4, 5 or 6 shed work; Side Shaft Tappet Ball Shuttle Motion; Brake on driving pulleys; Radius of crank: 2″, 2¼″, 2½″, 2¾″ and 3″. Cut-roll stands for either 8″, 12″, 16″, 18″ and 22″ diameter cut-rolls. Bartlett geared let-off motion or friction let-off. Shuttle boxes 18″ to 24″ long. Beam heads 12″ 13″, 14″, 15″, 16″, 16½″, 18¼″ and 22″ diameters. Either plain or tape selvage motion if desired. Pulleys: Tight and loose, or friction as desired: diameters 10″ to 15″ by 2″ face.

The Wide Loom.



THE WIDE LOOM

Designed for Wide Goods, either Plain, Drill or Twill

This loom is made for weaving goods from 72″ to 150″ wide. The general construction is of an exceptionally heavy character. It is fitted with a geared driving device, thus ensuring steady running under a light driving belt.

The torsion in the loom is reduced to a minimum by having the cam and crank shafts geared together at both ends.

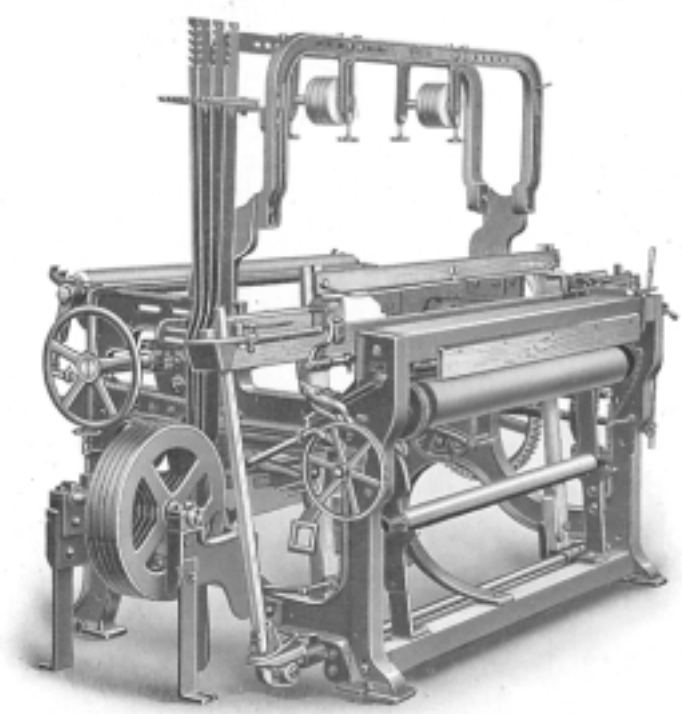
The **Pick Motion** is the well-known scroll type with adjustable cams.

One or more warp beams from 12″ to 16½″ in diameter may be used. When two beams are used, an even tension is maintained on the yarn from the beams to the cloth by means of a compound let-off motion.

The **Shuttle Boxes** are from 20″ to 24″ long.

The loom is usually fitted with the **Owen High-Cloth-Roll Motion** as shown in the illustration; but, if preferred, our old style 12″ cloth roll motion may be had instead.

Pulleys: Tight and loose, 15″, 16″ and 17″ diameters by 3″ face.



End-Cam Loom

END-CAM LOOM

For weaving Heavy Sheetings, Drills, Twills, Jeans Satinets, etc.

This loom is built especially heavy to withstand the severe strains due to weaving these kinds of goods.

The movements of the harnesses are positive, due to the peculiar **Harness Motion,** consisting of cams and jacks of capacity of two to eight harnesses. Owing to the location of the harness mechanism outside of the frame, cams are readily changed when different weaves are required.

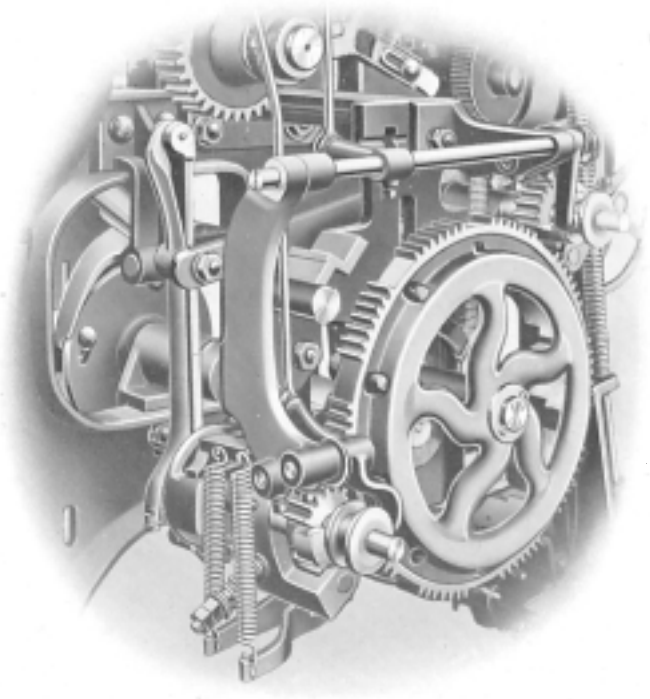
The loom may be fitted with either a friction or Bartlett let-off; high-cloth-roll motion, such as shown in illustration, or, if preferred, the **Owen High-Cloth-Motion** shown in illustration on page 183. Beam locks and friction driving pulleys if desired.

Beam Heads: $16\frac{1}{2}''$ diameter.

Pulleys: 10″ to 15″ diameter, 2″ face.

FANCY LOOMS

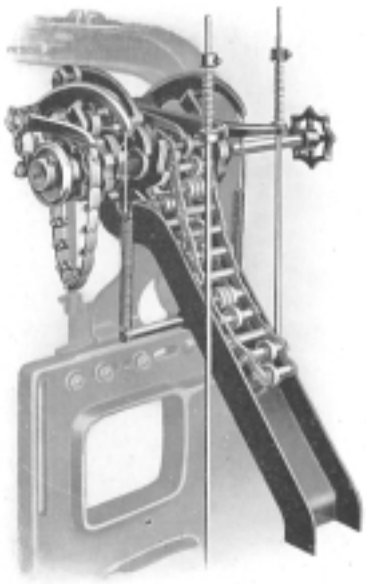
Under the name of fancy looms we include all looms for weaving cotton dress goods, gingham, plaids, stripes, lenos, handkerchiefs, etc. Our facilities for meeting the requirements of manufacturers of this class of goods is shown in the machines illustrated and described on the following pages.



Drop-Box Mechanism

Our Fancy Looms are fitted with either a drop-box motion or dobby or a combination of both to answer the particular requirements of the goods proposed to be woven.

The well-known **Crompton Box Motion** of two, four or six boxes into one is used. The shuttle boxes are carried positively into their correct positions by means of sliding gears and eccentrics combined with lifting levers, motion being imparted to the sliding gears by a mutilated gear actuated from the cam shaft. The changing of the boxes is accomplished through a wire connection between the sliding gears and pattern chain mechanism. A break-down motion is provided to prevent any injury to the shuttle boxes or drop-box mechanism due to a picker sticking or a shuttle failing to enter a box.

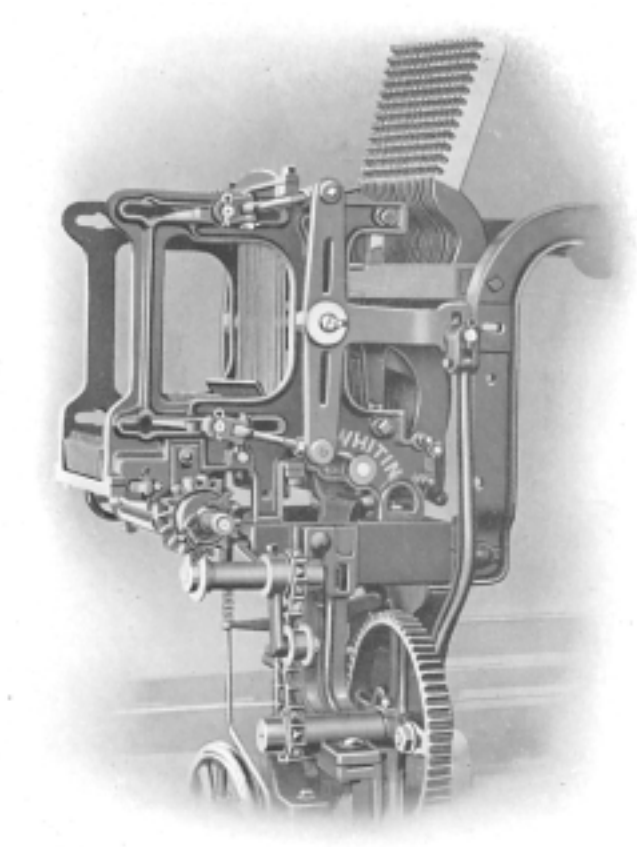


Drop-Box Pattern Chain and Multiplier

The Pattern Chain mechanism for indicating the drop-box mechanism is supported on a bracket fastened to the loom side, and is driven from a cam on the cam shaft, through a break-down lever and connecting rod.

A Multiplier attachment may be applied to the pattern chain mechanism whereby a large number of picks of one color may be woven into the cloth without the necessity of using a long and cumbersome pattern chain.

The Whitin Dobby has several features which commend themselves to the manufacturers of fancy cotton and silk goods. The



Dobby

sides are of a substantial as well as of pleasing design. They are rigidly held together by cross ties whose ends being milled to length ensures an accurate spacing between the sides for the indicating fingers, jack and harness levers. The top and bottom hook racks are made of malleable iron which reduces the breakage of these parts to a minimum. The top-rack being made in two parts facilitates the removal of the top and bottom hooks, jack levers and lifting wires.

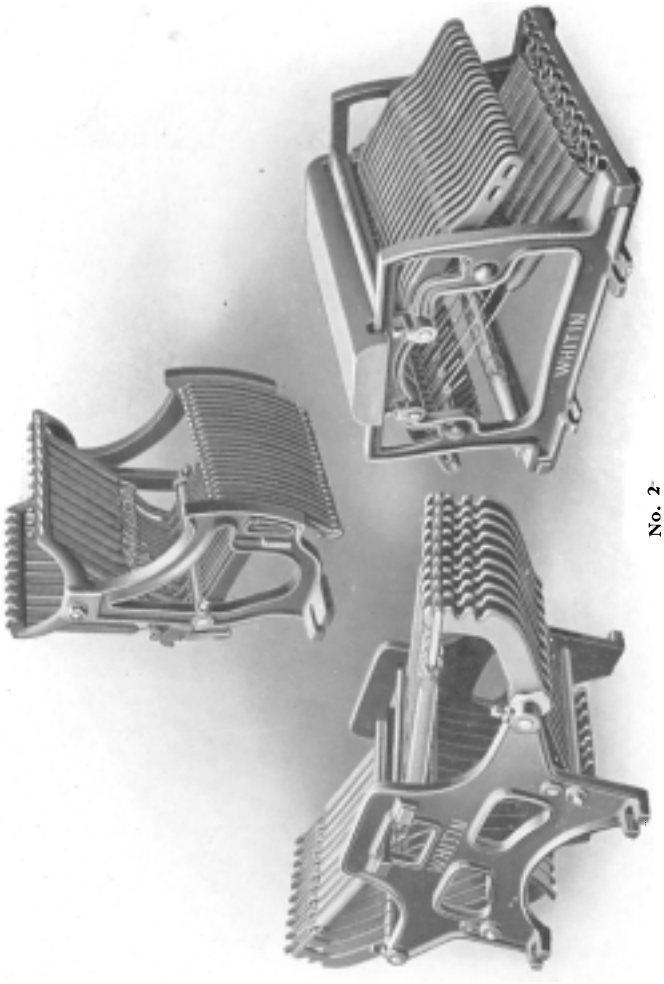
By means of the **Angular Shedding Device,** the harness levers are raised on an angle to conform to the angle of the shed, thus ensuring the correct amount of lift to each harness without undue strain on the warp. This is accomplished by the unequal travel of the opposite ends of the lifting knives in combination with an inclined back stop on the top cross tie for the jack levers. The harness levers are of such length as to guarantee a clear shed for all sizes of shuttles. The lifting knives are connected to the rocker arms by wrought-iron eye-bars with swivel adjusting joints of generous dimensions, thus ensuring freedom from wear and tending to prolong the life of the dobby. Soiling of the yarn or cloth by oil dropping from the lifting knives bearings and connections is prevented by a drip pan secured to the dobby side.

A Harness Levelling Device of simple and effective nature is provided.

We make two types of dobbies, viz: **Single** and **Double Index,** capacities ranging from 8 to 30 harnesses. They can be applied not only to the various patterns of Whitin looms, but also to looms of any other make.

The Single Index Dobby has but one row of pegs in each bar of the pattern chain, and one set of indicator fingers. Each finger indicates on both a top and bottom hook.

The Double Index Dobby has two rows of pegs in each bar of the pattern chain and two sets of indicator fingers. One row of pegs indicates for the top set of hooks, the other row for the bottom set. The chief advantage the double index dobby has over the single index is that with the former, one bar of the pattern chain serves for two picks of the loom, while with the latter, one bar serves for only one pick, therefore the double index dobby is more desirable for weaving long patterns, as it requires only half as many bars of



No. 1 No. 2 No. 3

Spring Jacks

chain as would be necessary to weave the same pattern on a single index dobby.

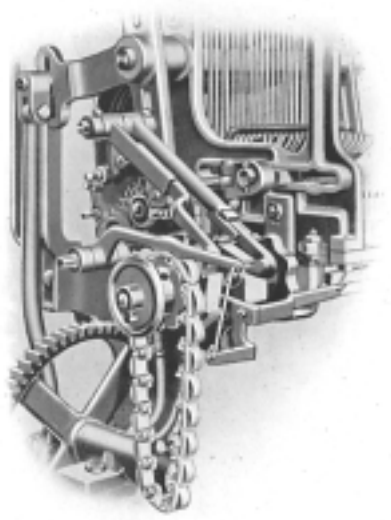
Motion is imparted to the dobby rocker-arm either from the crank or cam shaft of the loom, as ordered, the transmitting mechanism being so situated that there is no chance of oil spattering on the warp. The pattern chain cylinder may be driven by gearing from the crank shaft or by ratchet actuated from rocker arm as preferred.

For pulling the harnesses down, we furnish coiled springs attached to cast-iron holders fastened to the floor, or, if so ordered, any of the three types of **Spring Jacks** illustrated on page 191 may be had instead.

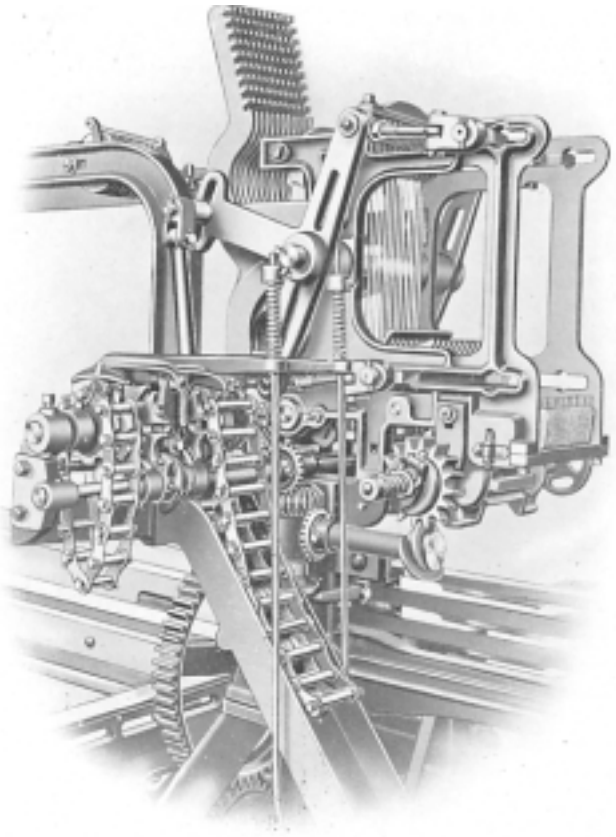
A simple and effective **Multiplier** for producing cross bar effects, handkerchiefs and the like, may be easily applied to our double index dobby.

Our Patented Jumper Morion applied to a dobby in combination with beams and yarn slackeners makes a very satisfactory arrangement for weaving **Leno** effects.

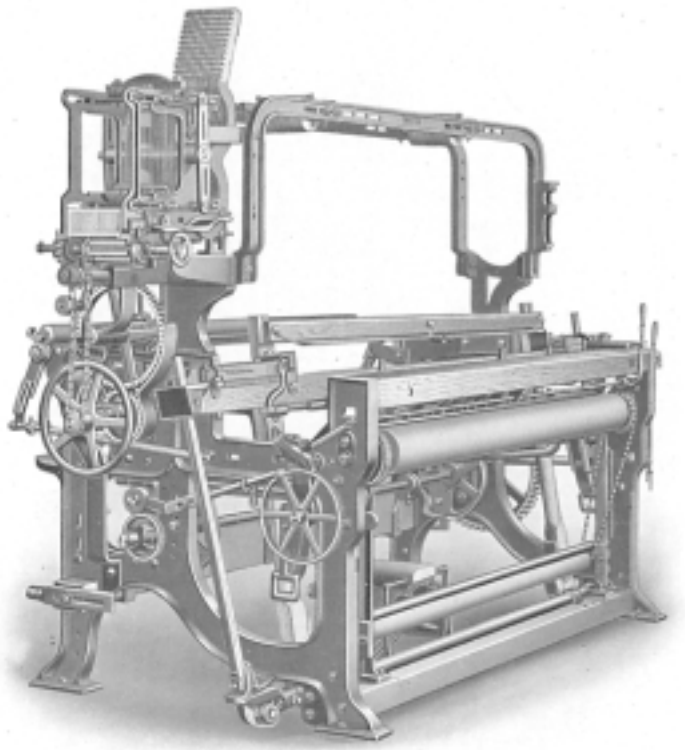
In looms fitted with both dobby and drop-box mechanisms, both pattern chains can be moved in unison from the front of the loom whenever it is necessary to turn the pattern mechanism back to match the pick in the pattern being woven. This construction prevents the possibility of a break in the pattern being woven, as there is no chance of the pattern chains getting out of time with each other.



Dobby Multiplier



Pattern Controlling Mechanism



Dobby Loom

DOBBY LOOM

We make several types of plain **dobby looms** for weaving various kinds of fancy cotton goods. Although similar in general construction they differ in harness capacity, single or double index dobbies, multiplier or leno attachments, cloth roll and take-up motions.

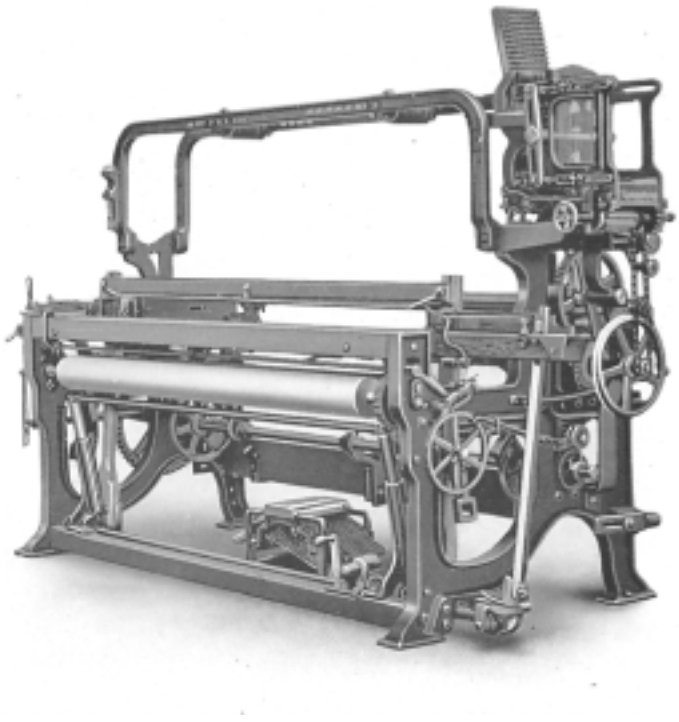
The Loom, illustrated on the preceding page, is admirably adapted for weaving fine or coarse fancy goods. Special attention is called to its heavy construction and well protected gearing, thus preventing accidents to the weaver.

The Dobby, as shown, is of the single index style, with worm drive for the pattern chain cylinder and a gear drive for the rocker-arm. A double index dobby may be had if desired.

A frictional chain wind **cloth roll** driving mechanism, in combination with a high sand roll, is used in combination with a take-up motion, which is easily arranged to take up every pick or alternately, as desired.

Optional Attachments: Bartlett or friction let-off; tight and loose or friction driving pulleys; dobby chain multiplier; leno motion with slackener bars; top beams and stands; beam locks; warp stop-motion; spring jacks.

Pulleys: 12″ or 14″ diameter by 2″ face.

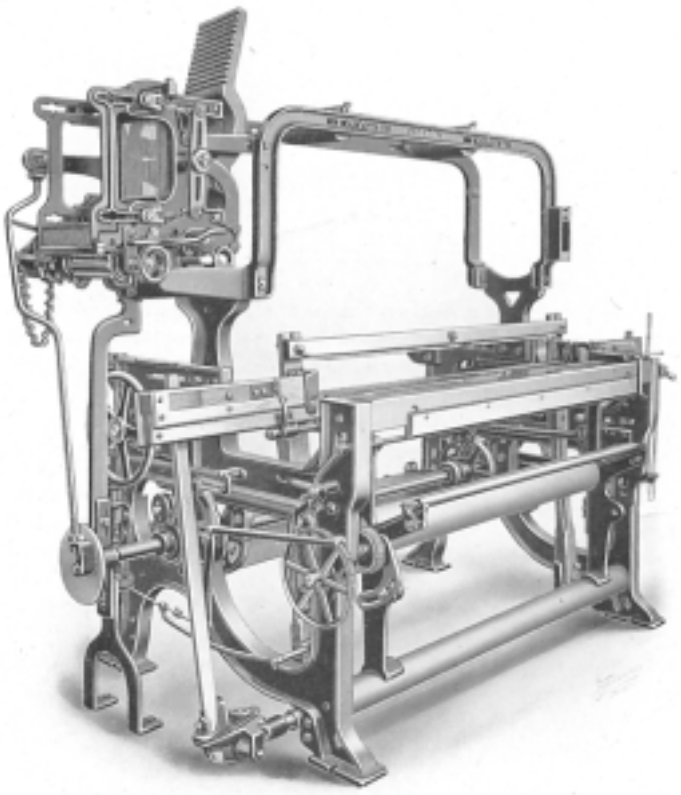


Dobby Loom

DOBBY LOOM

On the preceding page is shown another type of dobby loom, which is similar in all respects to that shown on page 194, excepting the **Owen patent cloth-roll motion** is used. This motion consists of a sand roll $4\frac{1}{2}''$ diameter, placed a short distance below the breast beam, and a cloth roll, held in movable bearings, pressed against the sand roll by compression springs, which exert a constantly increasing pressure as the roll of cloth increases in diameter. By the use of this arrangement access to the inside workings of the loom is easily had, and in addition wrinkling of the cloth, as it is being wound, is avoided to a great extent. A roll of cloth 12 to 13 inches in diameter may be made. The removal of the roll of cloth is easily accomplished, and may be done while the loom is in operation, by means of a worm, a few turns of which depress the cloth roll holders so that the pressure is removed and the roll of cloth may be removed and a new roll started.

Pulleys: 12″ or 14″ diameter by 2″ face.



Dobby Loom

DOBBY LOOM

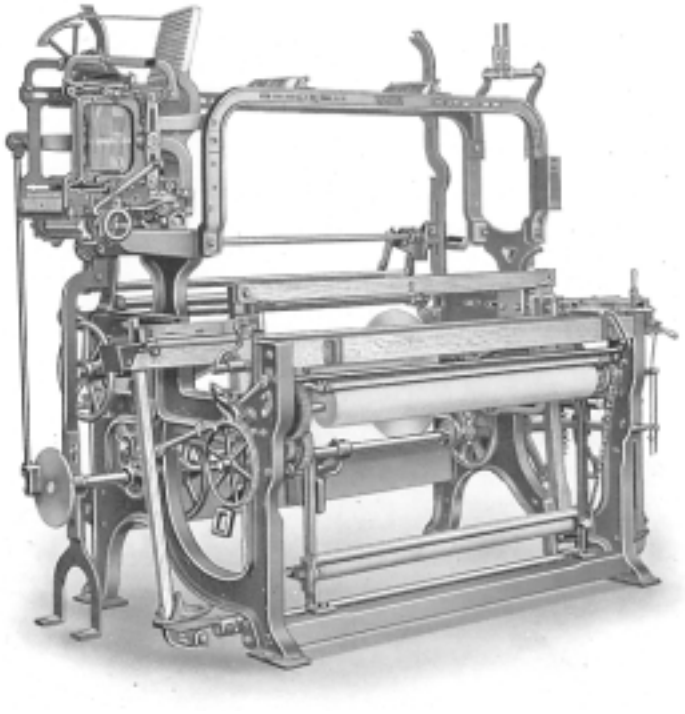
The loom illustrated on the preceding page shows our ordinary style of loom, fitted with a dobby, whose rocker-arms are actuated from the loom cam shaft. This is a very desirable method of driving, owing to its simplicity, ease of adjustment and freedom from the danger of oil soiling the warp.

The **Dobby Pattern Chain** mechanism is fitted with a multiplier which renders the loom admirably adapted for weaving handkerchiefs and like goods.

The **Cloth-Roll** motion shown in the illustration is especially popular on account of its simplicity, ease of operation and sensitiveness to the take-up pull-back motion. It is designed to wind a roll of cloth eight inches in diameter.

Optional Attachments: Bartlett or friction let-off; tight and loose or friction driving pulleys, leno motion with slackener bars; top beams and stands; beam locks; spring jacks; warp stop-motion.

Pulleys: 12″ or 14″ diameter by 2″ face.



Dobby Loom with Leno Motion

DOBBY LOOM

A very popular loom for weaving a wide range of coarse or fine fancy cotton goods is shown on the preceding page.

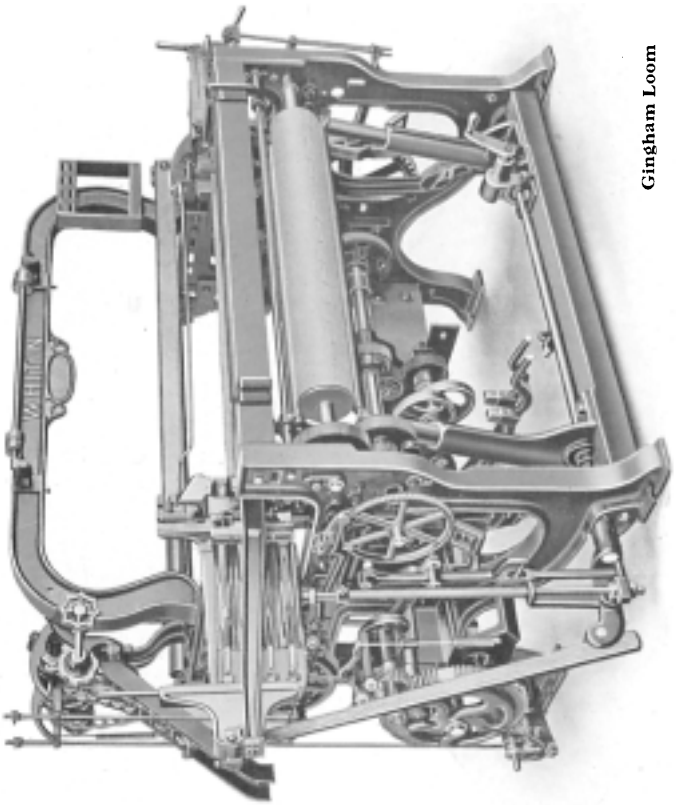
Motion is given to the dobby from the cam shaft by means of a connecting rod to the rocker arm, the pattern chain cylinder being actuated by a pawl and ratchet motion from the rocker arm.

A Leno Attachment, consisting of our Patented jumper motion, two slackener bars and stands for four beams is applied.

Any of our various styles of **Cloth Roll** motions may be had, as desired. The one shown in the illustration is especially popular, on account of having a full roll capacity of 18 inches diameter. The high sand-roll is advantageous as a means of reducing the wrinkling or shrinking of the cloth to a minimum and also prevents, to a great extent, breakages in the warp by taking the strain off the temples.

Optional Attachments: Tight and loose or friction driving pulleys; beam locks; spring jacks; pattern chain multiplier; warp stop-motion.

Pulleys: 12″ or 14″ diameter by 2″ face.



Gingham Loom

GINGHAM LOOM

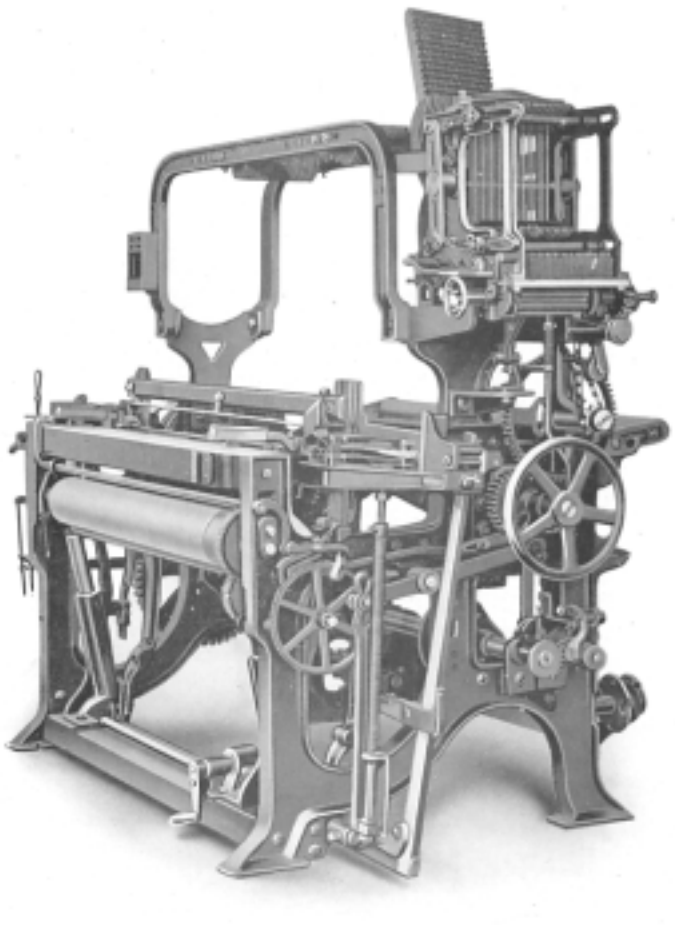
This loom is particularly adapted for weaving ginghams, cottonades and plaids, and is constructed with reference to weaving goods at the highest rate of speed consistent with quality desired. It is fitted with our ordinary harness cam motion, with auxiliary shaft, with which from two to six shed work may be woven.

The **Crompton Shuttle Box Motion** of four into one is used in combination with an efficient pattern chain mechanism. The pattern chain mechanism is so constructed that whenever the filling breaks, the motion of the chain is instantly arrested, and after the shuttle has been replaced and the loom restarted, the proper shuttle will be thrown without any adjustments of parts or loss of pick.

Our new **Chain Multiplier** used in combination with the box pattern chain is a great improvement over the old style disk multiplier on account of the ease in making up any desired combination.

The loom is fitted with the Owen high-cloth-roll motion, friction let-off, or beam locks, and friction pulley.

Pulleys: 12″ or 14″ diameter, 2″ face.



Two-Box Loom

TWO-BOX LOOM

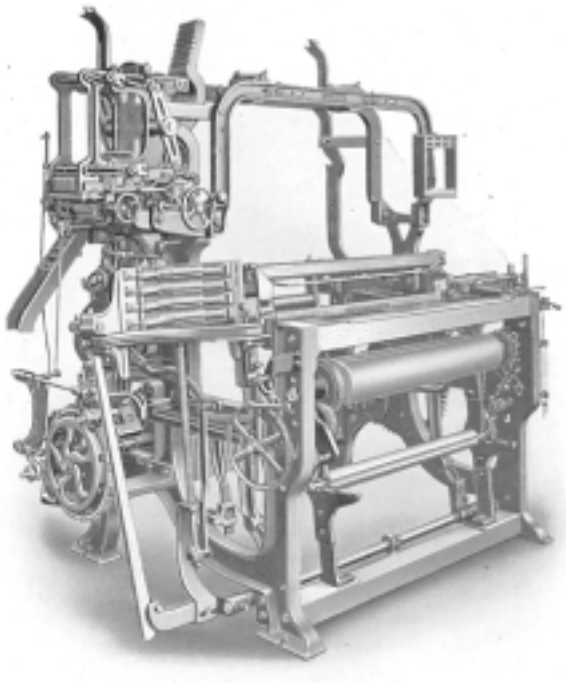
For Weaving Handkerchiefs, Strips, etc.

By reference to the illustration, it will be noted that the construction of this loom is of a very simple nature, of very few parts, easily adjusted, and not liable to get out of repair.

The motion of the drop-boxes may be controlled either by a pattern chain mechanism, such as illustrated on page 188, or by means of pattern pegs acting in conjunction with the dobby pattern mechanism, as shown in the illustration on the preceding page.

This loom may be fitted with any of our different styles of cloth-roll and take-up motions, friction or Bartlett let-off motions, friction pulley, beam locks, spring jacks, and warp stop-motion.

Pulleys: 12″ and 14″ diameter, 2″ face.



Four-Box Fancy Loom

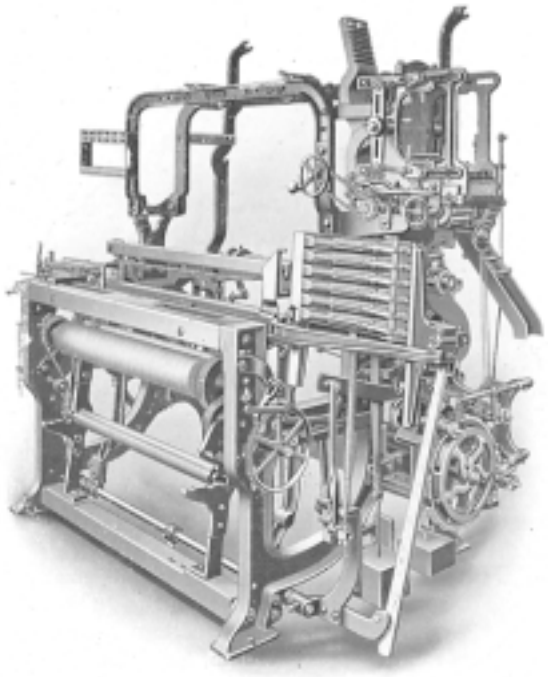
FOUR-BOX FANCY LOOM

As will be seen by reference to the illustration on the preceding page, this loom is of a rugged and substantial design. The sides, girts and arches are of such proportions as to readily withstand any strains that might arise in weaving fancy goods of all kinds. **The Box Mechanism** bracket is rigidly bolted to the loom side, thus ensuring positive and accurate alignment of the shuttle boxes with the race plate.

The Dobby is firmly seated on a heavy bracket bolted to the arch extension, and added solidity is given it by being strongly braced to the arches.

The loom may be fitted with any of our different types of cloth-roll and take-up motions, Bartlett or friction let-offs, Patented warp beam locks, friction pulley, box pattern chain multiplier, pattern chain controller, leno mechanism, spring jacks, warp stop-motion.

Pulleys: 12″ or 14″ diameter by 2″ face.



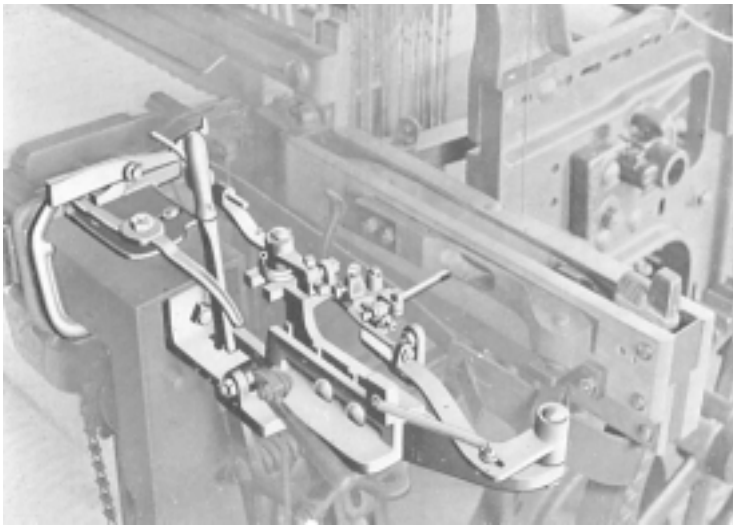
Six-Box Fancy Loom

This loom is similar in all respects to the four-box loom, with the exception of the drop-box and pattern chain mechanisms, being arranged for six boxes instead of four.

Pulleys: 12″ or 14″ diameter by 2″ face.

WHITIN-OWEN MISPICK PREVENTER

For Plain and Fancy Looms.



The Whitin-Owen Feeler-Motion operates successfully on more than one shuttle, without resetting, thus acting as a very reliable *mispick preventer* for plain and fancy looms.

By connecting the filling feeler-motion and the belt shipping-motion, to stop the loom just before the filling has run out, we save the operative "picking out" the filling end, and turning the pattern and box-chains back to find the "pick," whether dobbies or jacquards are used. As the take-up is not lifted out by this motion, thick and thin places are absolutely prevented, beside saving the operative's strength and time in throwing back the heavy lay parts.

This motion applied to a weft-replenishing loom fulfills all the requirements of an **ideal filling feeler.**

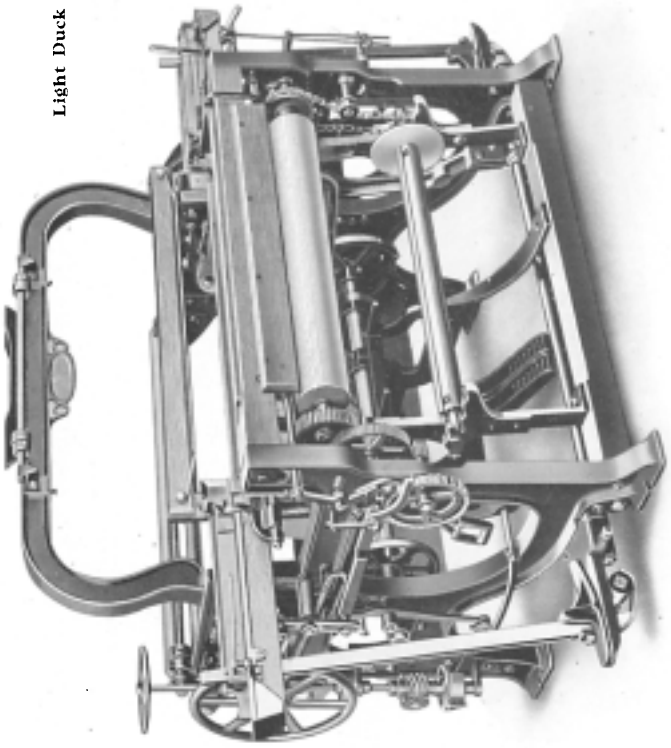
DUCK LOOMS

The manufacture of looms for weaving duck of all kinds, from the lightest sail duck to the heaviest belting duck, has been a specialty with us for several years. Owing to the extremely heavy nature of this class of goods the machinery for weaving them is of necessity much heavier in construction than is required for the ordinary grades of cloth.

We make four different types of looms for weaving duck: The Light, the Intermediate, the Medium and the Heavy Duck Looms. These looms are capable of weaving a wide range of goods of varying widths and weights.

The **Heavy Pattern Loom**, illustrated on page 181, is admirably adapted for weaving heavy osnaburgs and denims, flat duck up to 40″, soft hose and belting duck up to 42″, and Nos. 9 and 10 hard duck up to 42″ wide. For heavier and wider duck use looms such as described on the following pages.

Light Duck Loom



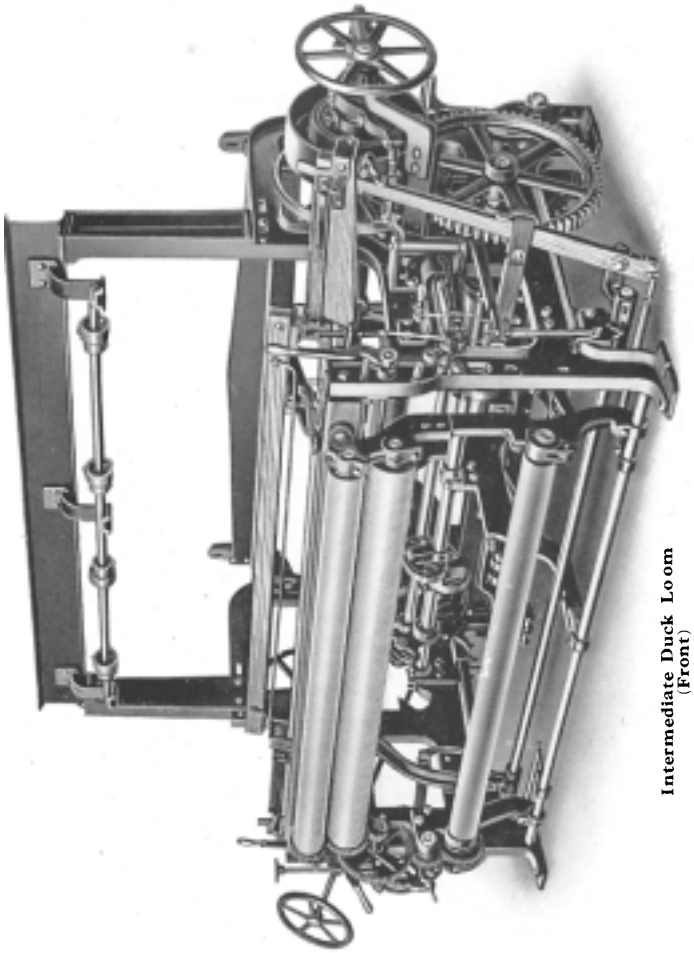
LIGHT DUCK LOOM

This loom is designed for weaving sail cloth, army duck and all light duck goods up to 32″ wide.

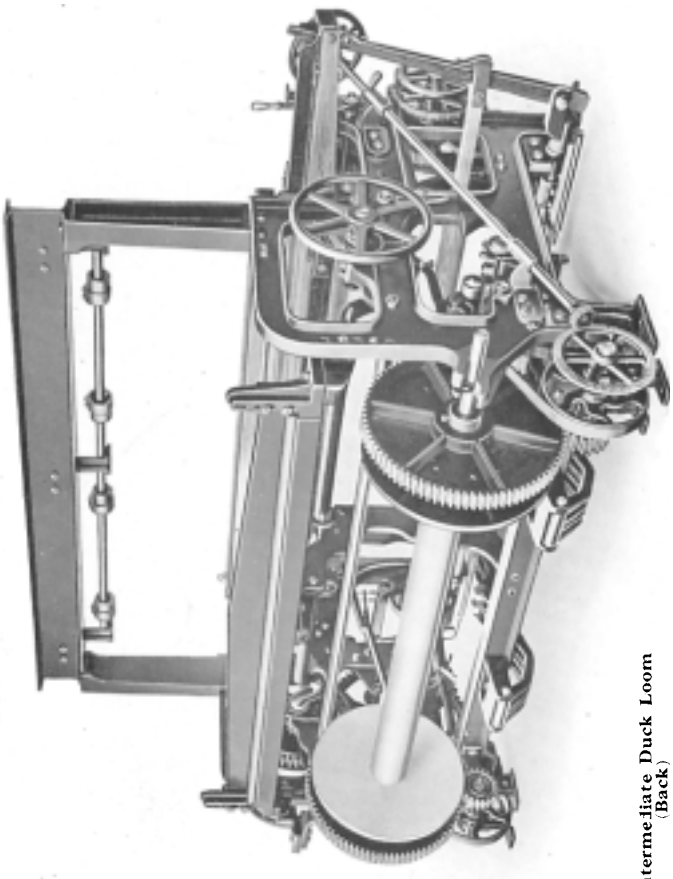
The general design of the frame and arch is similar to our Heavy Pattern Loom. Particular attention is called to the Bartlett let-off of very rugged design, and the high-cloth-roll motion, a combination which manufacturers will find is particularly adapted for light duck weaving. Changes in the number of picks being woven is readily accomplished by means of change ratchet gears.

The drive may be either by tight and loose pulleys or by friction, as preferred.

Pulleys: 14″ diameter by 3″ face.



Intermediate Duck Loom
(Front)



Intermediate Duck Loom
(Back)

INTERMEDIATE DUCK LOOM

The loom is designed for weaving light duck goods, such as sail cloth, army ducks and Nos. 7, 8, 9 and 10 hard duck up to 44″ wide.

The Framing of this loom is especially strong and substantial in construction, and rigidly bolted together, thus producing a secure foundation for all the operative parts of the loom. The crank and cam shafts are proportionally heavy and have rugged bearings on each end and on sampsons.

The Lathe is made of tough, well seasoned lumber, and is fitted with steel race plates. The shuttle boxes are of iron with steel binders. The hand rail is of ash, re-enforced by a steel plate, and an efficient shuttle guard is applied thereon. The swords are of iron and swing on a heavy iron shaft, rigidly hung to the frame. The pitmans are usually made of iron, but, if preferred, may be made of wood, provided with metal straps and regulating bolts, to take up the backlash in the pitman bearings.

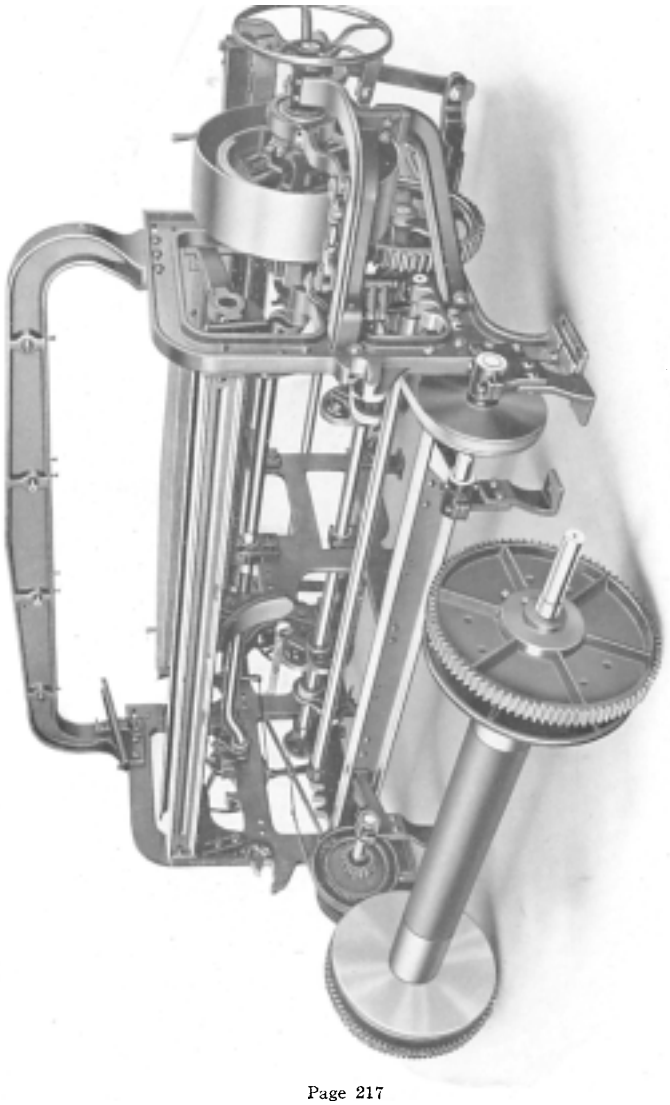
The Harness are operated from the bottom shaft by means of two or more sets of cams and treadles, according to the width of the loom.

The Let-off motion may be a Bartlett or a friction device, the tension of which can be readily adjusted by the weaver at the front of the loom. A mechanism is also provided for reversing the warp beam. The warp tension bars are of rugged design, and simple adjusting means are provided for varying the tension on the warp yarn.

The Take-up Motion is positively driven from the crank shaft, giving a steady motion to the take-up-rolls, thus ensuring even cloth. The take-up rolls are of iron, covered with steel filleting. The cloth roll is of wood, slidably mounted on a square iron shaft, which can be readily removed when the cloth roll is full.

The Picking Motion is the well known "batwing" style, and is so designed as to give an easy, even pick on all widths of goods. The loom is driven by a **Friction Pulley,** 16″ diameter by $4\frac{3}{4}$″ face, on the crank shaft. A powerful **Brake Mechanism,** actuated from the shipper is supplied, as is also a very efficient brake relief.

Medium Duck Loom (Front)



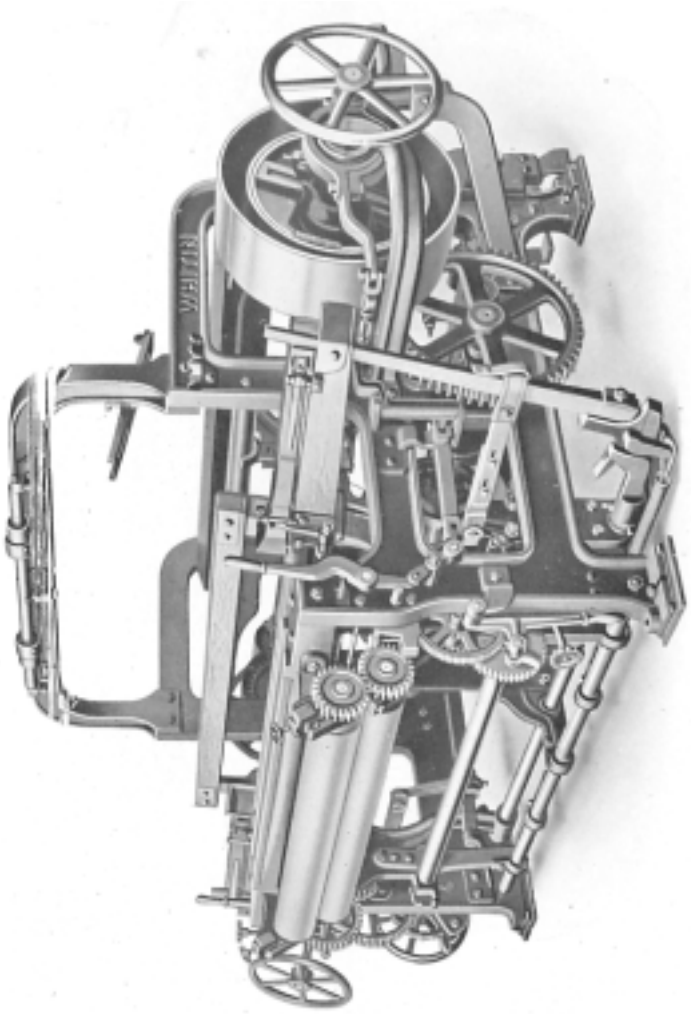
Medium Duck Loom (Back)

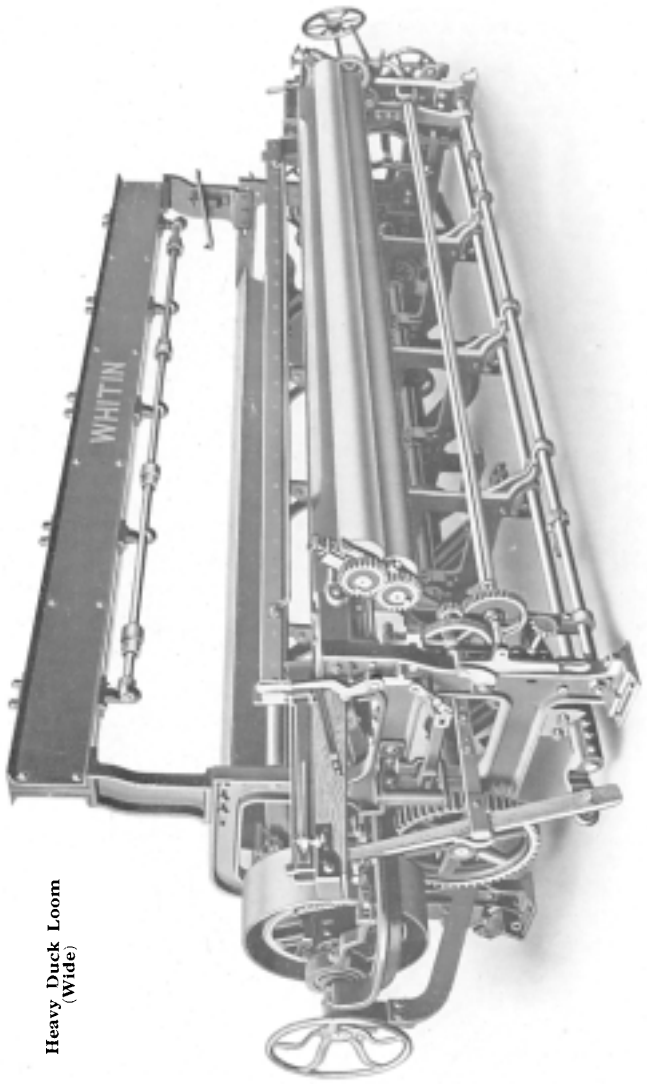
MEDIUM DUCK LOOM

This loom is particularly adapted for weaving medium belting, heavy tent cloths and similar goods.

The construction is practically the same as that of our Heavy Duck Loom, with the exception of having a somewhat lighter design of warp tension bars, and a different arrangement for driving, the driving pulley being on the crank shaft instead of back geared. For further details, see description of the Heavy Duck Loom.

Pulleys: 24″ diameter by 8″ face.





Heavy Duck Loom
(Wide)

HEAVY DUCK LOOM

This loom is particularly adapted for weaving the following weights and widths of duck: Nos. 6 to 10, up to 176″ wide; No. 2 duck, up to 128″ wide; 4/0 hard duck up to 60″ wide; 8/0 hard duck up to 36″ to 40″ wide; and 12/0 hard duck up to 18″ to 20″ wide.

The General Construction of this loom is exceptionally heavy, especially in the wider patterns. All looms up to 82″ reed space have a heavy middle support or sampson providing additional supporting means for shafts and girts. Two or more sampsons are used on looms exceeding this width. To prevent deflection due to the heavy lift of the harnesses the arches on the wider widths of looms are made of heavy channel bars, as shown in illustration on the preceding page.

The Friction Driving Pulley, which is unusually heavy and substantial, transmits power to the loom through an auxiliary shaft, geared at each end to the crank shaft. This method of driving permits the use of a narrower belt than if the pulley was directly on the crank shaft, and also ensures a steady running loom.

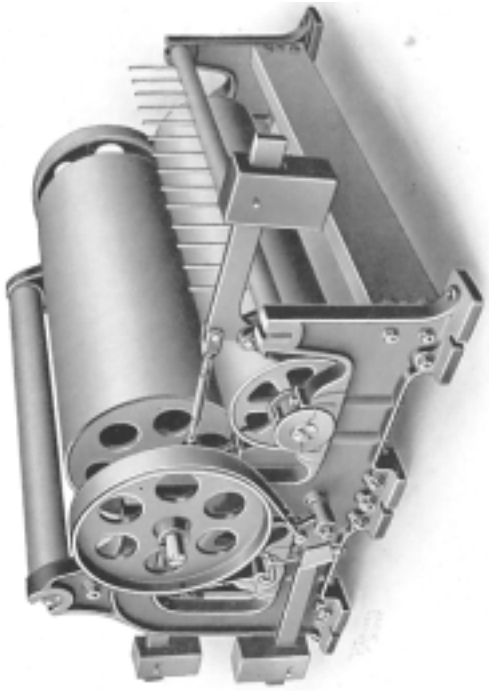
The Warp Beam is heavily constructed of a wrought-iron barrel, fitted with cast-iron heads of ample proportions. To provide for weaving goods of less width than the maximum reed space allows, the beams are fitted with adjustable heads.

The Let-off operates through friction due to band pulleys on shafts geared to the warp beam heads. By means of hand wheels at the front of the loom the friction on the beam can be adjusted and also released, thus allowing the beam to be reversed with a minimum amount of effort on the part of the weaver. The warp tension bars are extremely rugged in design and effectual in operation.

The Harnesses are operated from the bottom shaft by cams and treadles, two or more sets being used according to the width of the loom.

The Take-up is positively driven from the cam shaft, taking up every pick. It is fitted with fluted iron take-up rolls and an iron cloth roll, the cloth roll being located as low as possible to admit of winding a large roll of cloth.

The Driving Pulley is 24″ in diameter by 8″ face, and runs 2.23 revolutions to one of the crank shaft.

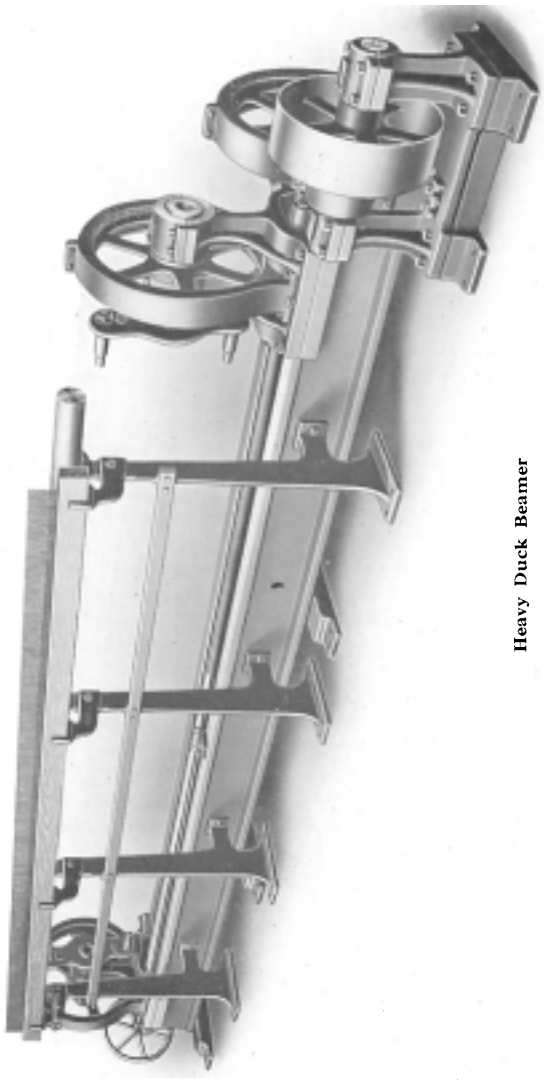


Extra Heavy Friction Rolls

EXTRA HEAVY FRICTION ROLLS

This machine is designed to impart any desired tension to the heaviest duck warps during the operation of beaming. The framing, rolls and bearings are made exceptionally heavy to withstand the heavy pull of the beaming machine. Friction is applied to the top-roll by means of a friction pulley on each end of the roll shaft. The friction on the bottom rolls is varied by levers with adjustable weights acting in conjunction with brake shoes on the surface of the rolls.

Width of rolls 60″.



Heavy Duck Beamer

HEAVY DUCK BEAMER

This machine is especially designed for beaming from chains or sectional beams, for the heaviest duck work that may be required. The yarn is drawn from the friction rolls through a reed, located at the back of the machine, by a heavily built driving mechanism. The head and foot beam stocks are readily adjusted to each other for different lengths of beams by means of a hand wheel fixed to a shaft which has a right and left screw thereon.

Pulleys: 18″ diameter by 6″ face.

SPECIFICATIONS FOR LOOMS

How many **Looms**?
Width of Cloth?
Reed Space?
Distance between Swords?
What Pattern of Loom Sides?
Length of Girts?
Are they to have Auxiliary Shaft?
For Plain or Twilled Work?
Size and Kind of Pulleys?
Belt from Above or Below?
How many Right Hand?
How many Left Hand?
Gears on Head or Foot End?
Crank Shaft to extend from web of Loom?
Cam Shaft to extend from web of Loom?
Gears on Cam Shaft?
What kind of Shuttle Box?
Length of Shuttle Box?
Height?
Width?
Length of Shuttle?
Height?
Width?
Shuttle Pocket?
Width and Kind of Race Plate?
What size of Beam Heads?
Distance between Heads?
Size of Beam Barrel?
Kind of Whip Roll and Size of Bearing?
What Let-Off Motion?
What kind of Friction Let-Off Weights?
Radius of Crank Shaft?
Diameter of Crank Shaft?
Diameter of Cam Shaft?
What Pick Motion?
Large or Small Pick Cams?
Horizontal or Perpendicular Pick Shaft Dogs?

Number of Picks per inch?
Ratchet?
Sand Roll Gear?
Sleeve Gear?
Pinion Gear?
Compound Gear?
Pick Gear?
Take-Up, Every Pick or Every Other Pick?
What Pattern Filling Fork?
Straight or Bevelled Reed Slot?
What Diameter of Cut of Cloth?
What Kind of Covering on Sand Roll?
What kind of Shuttle Guard?
Leather or Iron Pitman Straps?
What kind of Sweep Stands?
Hand Wheel on Head or Foot End?
Width and Color of Breast Beam?
Are Breast Beams to be cut out for Temple Plates?
Note—We allow 1½ Yarn Beams per Loom, and 1 Pick Gear per Loom.
We do not supply Strapping nor Sweep Sticks and Bolts.
How many **Dobbies**?
How many Levers?
Double or Single Index?
Long or Short Levers?
Worm or Pull Dog Drive on Cylinders?
Driven from Cam or Crank Shaft?
Light or Heavy Hooks?
Dobby Brace to?
Leather or Cotton Straps and Length?
How many Pattern Bars?
How many Pattern Bar Pins?
Distance between Harness Frame Hooks?
Angular or Parallel Motion?
Hook or Toggle Joints on Knife?
How many Direct Springs?
How many **Warp Stop Motions**?
Model of Warp Stop Motion?
Number of Yarn?
Style of Drop Wire?
Number of Drop Wires per Motion?

Table of Floor Space Required for The Standard Whitin Looms

Name of Loom	Length of Lay		Width outside Breast Beam to outside 16½″ Warp Beam		Distance between Swords	Reed Space
	Feet	Inches	Feet	Inches	Inches	Inches
24 in.	5	11⅜	3	6¾	31	29½
25	6	0⅜	3	6¾	32	30½
28	6	3⅜	3	6¾	35	33½
30	6	5⅛	3	6¾	36½	35
31	6	6⅜	3	6¾	38	36½
32	6	7⅜	3	6¾	39	37½
33	6	8⅜	3	6¾	40	38½
34	6	9⅜	3	6¾	41	39½
36	6	11⅜	3	6¾	43	41½
37	7	0⅜	3	6¾	44	42½
38	7	1⅜	3	6¾	45	43½
40	7	3⅜	3	6¾	47	45½
41	7	4⅜	3	6¾	48	46½
42	7	5⅜	3	6¾	49	47½
44	7	7⅜	3	6¾	51	49½
45	7	8⅜	3	6¾	52	50½
46	7	9⅜	3	6¾	53	51½
48	7	11⅜	3	6¾	55	53½
50	8	1⅜	3	6¾	57	55½
52	8	4⅛	3	6¾	59½	58
54	8	6⅛	3	6¾	61½	60
56	8	8⅛	3	6¾	63½	62
60	9	0⅝	3	6¾	68	66½
64	9	4⅝	3	6¾	72	70½
66	9	6⅝	3	6¾	74	72½
70	9	10⅝	3	6¾	78	76½
72	10	4	3	11¼	80	78½
74	10	7	3	11¾	83	81½
79	11	0	3	11¾	88	86½
80	11	1	3	11¾	89	87½
81	11	2	3	11¾	90	88½
82	11	4	3	11¾	92	90½
88	11	10	3	11¾	98	96½
90	12	0	3	11¾	100	98½
92	12	2	3	11¾	102	100½
98	12	8	3	11¾	108	106½
99	12	9	3	11¾	109	107½
100	12	10	3	11¾	110	108½
101	12	11	3	11¾	111	109½
107	13	6	3	11¾	118	116½
108	13	8	3	11¾	120	118½
124	15	0	3	11¾	136	134½
150	17	8	3	11¾	164	162½

Note.—The above table has for its basis our regular standard 40″ heavy pattern loom. The name of loom is so given for convenience, as the number of inches given is not intended to indicate the exact width of cloth, as this will vary according to quality of cotton used, number of picks, and number of yarn, etc. In the list above, 24″ to 72″ looms, inclusive, have shuttle boxes 20⅝″ long, which is a suitable length for 15″ shuttles. From 72″ upwards, a 22″ to 26″ box is used. We make boxes 18″ to 26″ long, and when variations are made from standard size, there will be a corresponding variation in the length of lathe.

The Whitin Standard Looms

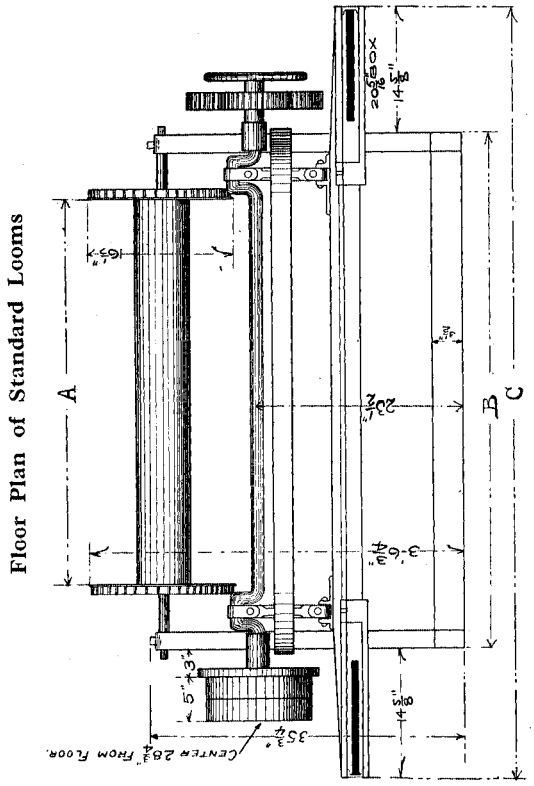
Names of Looms	24″	25″	28″	30″	31″	32″	33″	34″	36″	37″	38″
A	28″	29″	32″	34″	35″	36″	37″	38″	40″	41″	42″
B	41 3/8″	43 3/8″	46 3/8″	47 7/8″	49 3/8″	50 3/8″	51 3/8″	52 3/8″	54 3/8″	55 3/8″	56 3/8″
C	71 5/8″	72 5/8″	75 5/8″	77 1/8″	78 5/8″	79 5/8″	80 5/8″	81 5/8″	83 5/8″	84 5/8″	85 5/8″

Names of Looms	40″	41″	42″	44″	45″	46″	48″	50″	52″	54″	56″
A	44″	45″	46″	48″	49″	50″	52″	54″	56″	58″	60″
B	58 3/8″	59 3/8″	60 3/8″	62 3/8″	63 3/8″	64 3/8″	66 3/8″	68 3/8″	70 3/8″	72 3/8″	74 7/8
C	87 5/8″	88 5/8″	89 5/8″	91 5/8″	92 5/8″	93 5/8″	95 5/8″	97 5/8″	100 1/8″	102 1/4″	104 1/8″

Names of Looms	60″	64″	66″	70″	72″	74″	79″	80″	81″	82″
A	64″	68″	70″	74″	76″	78″	83″	84″	85″	86″
B	79 3/8″	83 3/8″	85 3/8″	89 3/8″	94 3/4″	105″	110″	111″	112″	114″
C	108 5/8″	112 5/8″	114 3/8″	118 5/8″	124″	127″	132″	133″	134″	136″

Names of Looms	88″	90″	92″	98″	99″	100″	101″	107″	108″	124″	150
A	92″	94″	96″	102″	103″	104″	105″	111″	112″	128″	154″
B	120″	122″	124″	130″	131″	132″	133″	140″	142″	158″	190″
C	142″	144″	146″	152″	153″	154″	155″	162″	164″	180″	212″

Floor Plan of Standard Looms



The Whitin Loom.

Table showing the number of yards of Cloth produced in one day of 10 hours.

Revolutions of Crank Shaft per Minute.

Picks per Inch.	100	110	120	130	140	150	155	160	165	170	175	180	185	190	195	200	210	Picks per Inch.
	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	
30	50.0	55.0	60.0	65.0	70.0	75.0	77.5	80.0	82.5	85.0	87.5	90.0	92.5	95.0	97.5	100.0	105.0	30
32	46.9	51.6	56.3	60.9	65.6	70.3	72.7	75.0	77.3	79.7	82.0	84.4	86.7	89.1	91.4	93.8	98.4	32
36	41.7	45.8	50.0	54.2	58.3	62.5	64.6	66.7	68.8	70.8	72.9	75.0	77.1	79.2	81.3	83.3	87.5	36
40	37.5	41.3	45.0	48.8	52.5	56.3	58.1	60.0	61.9	63.8	65.6	67.5	69.4	71.3	73.1	75.0	78.8	40
42	35.7	39.3	42.9	46.4	50.0	53.6	55.4	57.1	58.9	60.7	62.5	64.3	66.0	67.9	69.6	71.4	75.0	42
44	34.1	37.5	40.9	44.3	47.7	51.1	52.8	54.5	56.3	58.0	59.7	61.4	63.1	64.8	66.5	68.2	71.6	44
46	32.6	35.9	39.1	42.4	45.7	48.9	50.5	52.2	53.8	55.4	57.1	58.7	60.3	62.0	63.6	65.2	68.5	46
48	31.3	34.4	37.5	40.6	43.8	46.9	48.4	50.0	51.6	53.1	54.7	56.3	57.8	59.4	60.9	62.5	65.6	48
50	30.0	33.0	36.0	39.0	42.0	45.0	46.5	48.0	49.5	51.0	52.5	54.0	55.5	57.0	58.5	60.0	63.0	50
52	28.8	31.7	34.6	37.5	40.4	43.3	44.7	46.2	47.6	49.0	50.5	51.9	53.4	54.8	56.3	57.7	60.6	52
54	27.8	30.6	33.3	36.1	38.9	41.7	43.1	44.4	45.8	47.2	48.6	50.0	51.4	52.8	54.2	55.6	58.3	54
56	26.8	29.5	32.1	34.8	37.5	40.2	41.5	42.9	44.2	45.5	46.9	48.2	49.6	50.9	52.2	53.6	56.3	56
58	25.9	28.4	31.0	33.6	36.2	38.8	40.1	41.4	42.7	44.0	45.3	46.6	47.8	49.1	50.4	51.7	54.3	58
60	25.0	27.5	30.0	32.5	35.0	37.5	38.8	40.0	41.3	42.5	43.8	45.0	46.3	47.5	48.8	50.0	52.5	60
62	24.2	26.6	29.0	31.5	33.9	36.3	37.5	38.7	39.9	41.1	42.3	43.5	44.8	46.0	47.2	48.4	50.8	62
64	23.4	25.8	28.1	30.5	32.8	35.2	36.3	37.5	38.7	39.8	41.0	42.2	43.4	44.5	45.7	46.9	49.2	64
66	22.7	25.0	27.3	29.5	31.8	34.1	35.2	36.4	37.5	38.6	39.8	40.9	42.0	43.2	44.3	45.5	47.7	66
68	22.1	24.3	26.5	28.7	30.9	33.1	34.2	35.3	36.4	37.5	38.6	39.7	40.8	41.9	43.0	44.1	46.3	68
70	21.4	23.6	25.7	27.9	30.0	32.2	33.2	34.3	35.4	36.4	37.5	38.6	39.6	40.7	41.8	42.9	45.0	70
72	20.8	22.9	25.0	27.1	29.2	31.3	32.3	33.3	34.4	35.4	36.5	37.5	38.5	39.6	40.6	41.7	43.7	72

NOTE:—In the above tables, 10 per cent. of the time is allowed for changing shuttle, cleaning, oiling, etc.

The Whitin Loom. Continued.

Table showing the number of yards of Cloth produced in one day of 10 hours.

Picks per Inch.	Revolutions of Crank Shaft per Minute.																	Picks per Inch.
	100	110	120	130	140	150	155	160	165	170	175	180	185	190	195	200	210	
	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	
74	20.3	22.3	24.3	26.4	28.4	30.4	31.4	32.4	33.4	34.5	35.5	36.5	37.5	38.5	39.5	40.5	42.6	74
76	19.7	21.7	23.7	25.7	27.6	29.6	30.6	31.6	32.6	33.6	34.5	35.5	36.5	37.5	38.5	39.5	41.4	76
78	19.2	21.2	23.1	25.0	26.9	28.8	29.8	30.8	31.7	32.7	33.7	34.6	35.6	36.5	37.5	38.5	40.4	78
80	18.8	20.6	22.5	24.4	26.3	28.1	29.1	30.0	30.9	31.9	32.8	33.8	34.7	35.6	36.6	37.5	39.4	80
82	18.3	20.1	22.0	23.8	25.6	27.4	28.4	29.3	30.2	31.1	32.0	32.9	33.8	34.8	35.7	36.6	38.4	82
84	17.9	19.6	21.4	23.2	25.0	26.8	27.7	28.6	29.5	30.4	31.3	32.1	33.0	33.9	34.8	35.7	37.5	84
86	17.4	19.2	20.9	22.7	24.4	26.2	27.0	27.9	28.8	29.7	30.5	31.4	32.3	33.1	34.0	34.9	36.6	86
88	17.0	18.8	20.5	22.2	23.9	25.6	26.4	27.3	28.1	29.0	29.8	30.7	31.5	32.4	33.2	34.1	35.8	88
90	16.7	18.3	20.0	21.7	23.3	25.0	25.8	26.7	27.5	28.3	29.2	30.0	30.8	31.7	32.5	33.3	35.0	90
92	16.3	17.9	19.6	21.2	22.8	24.5	25.3	26.1	26.9	27.7	28.5	29.3	30.2	31.0	31.8	32.6	34.2	92
94	16.0	17.6	19.1	20.7	22.3	23.9	24.7	25.5	26.3	27.1	27.9	28.7	29.5	30.3	31.1	31.9	33.5	94
96	15.6	17.2	18.8	20.3	21.9	23.4	24.2	25.0	25.8	26.6	27.3	28.1	28.9	29.7	30.5	31.3	32.8	96
98	15.3	16.8	18.4	19.9	21.4	23.0	23.7	24.5	25.3	26.0	26.8	27.6	28.3	29.1	29.8	30.6	32.1	98
100	15.0	16.5	18.0	19.5	21.0	22.5	23.3	24.0	24.8	25.5	26.3	27.0	27.8	28.5	29.3	30.0	31.5	100
102	14.7	16.2	17.6	19.1	20.6	22.1	22.8	23.5	24.3	25.0	25.7	26.5	27.2	27.9	28.7	29.4	30.9	102
104	14.4	15.9	17.3	18.8	20.2	21.6	22.4	23.1	23.8	24.5	25.2	26.0	26.7	27.4	28.1	28.8	30.3	104
106	14.2	15.6	17.0	18.4	19.8	21.2	21.9	22.6	23.3	24.1	24.8	25.5	26.2	26.9	27.6	28.3	29.7	106
108	13.9	15.3	16.7	18.1	19.4	20.8	21.5	22 2	22.9	23.6	24.3	25.0	25.7	26.4	27.1	27.8	29.2	108
110	13.6	15.0	16.4	17.7	19.1	20.5	21.1	21.8	22.5	23.2	23.9	24.5	25.2	25.9	26.6	27.3	28.6	110
112	13.4	14.7	16.1	17.4	18.8	20.1	20.8	21.4	22.1	22.8	23.4	24.1	24.8	25.4	26.1	26.8	28.1	112

NOTE:—In the above tables, 10 per cent. of the time is allowed for changing shuttle, cleaning, oiling, etc.

The Whitin Loom. Continued.

Table showing the number of yards of Cloth produced in one day of 10 hours.

Picks per Inch.	Revolutions of Crank Shaft per Minute. 100 YDS	110 YDS	120 YDS	130 YDS	140 YDS	150 YDS	155 YDS	160 YDS	165 YDS	170 YDS	175 YDS	180 YDS	185 YDS	190 YDS	195 YDS	200 YDS	210 YDS	Picks per Inch.
114	13.2	14.5	15.8	17.1	18.4	19.7	20.4	21.1	21.7	22.4	23.0	23.7	24.3	25.0	25.7	26.3	27.6	114
116	12.9	14.2	15.5	16.8	18.1	19.4	20.0	20.7	21.3	22.0	22.6	23.3	23.9	24.6	25.2	25.9	27.2	116
118	12.7	14.0	15.3	16.5	17.8	19.1	19.7	20.3	21.0	21.6	22.2	22.9	23.5	24.2	24.8	25.4	26.7	118
120	12.5	13.8	15.0	16.3	17.5	18.8	19.4	20.0	20.6	21.3	21.9	22.5	23.1	23.8	24.4	25.0	26.3	120
122	12.3	13.5	14.8	16.0	17.2	18.4	19.1	19.7	20.3	20.9	21.5	22.1	22.7	23.4	24.0	24.6	25.8	122
124	12.1	13.3	14.5	15.7	16.9	18.1	18.8	19.4	20.0	20.6	21.2	21.8	22.4	23.0	23.6	24.2	25.4	124
126	11.9	13.1	14.3	15.5	16.7	17.9	18.5	19.0	19.6	20.2	20.8	21.4	22.0	22.6	23.2	23.8	25.0	126
128	11.7	12.9	14.1	15.2	16.4	17.6	18.2	18.8	19.3	19.9	20.5	21.1	21.7	22.3	22.9	23.4	24.6	128
130	11.5	12.7	13.8	15.0	16.2	17.3	17.9	18.5	19.0	19.6	20.2	20.8	21.3	21.9	22.5	23.1	24.2	130
132	11.4	12.5	13.6	14.8	15.9	17.0	17.6	18.2	18.8	19.3	19.9	20.5	21.0	21.6	22.2	22.7	23.9	132
134	11.2	12.3	13.4	14.6	15.7	16.8	17.4	17.9	18.5	19.0	19.6	20.1	20.7	21.3	21.8	22.4	23.5	134
136	11.0	12.1	13.2	14.3	15.4	16.5	17.1	17.6	18.2	18.8	19.3	19.9	20.4	21.0	21.5	22.1	23.2	136
138	10.9	12.0	13.0	14.1	15.2	16.3	16.8	17.4	17.9	18.5	19.0	19.6	20.1	20.7	21.2	21.7	22.8	138
140	10.7	11.8	12.9	13.9	15.0	16.1	16.6	17.1	17.7	18.2	18.8	19.3	19.8	20.4	20.9	21.4	22.5	140
142	10.6	11.6	12.7	13.7	14.8	15.8	16.4	16.9	17.4	18.0	18.5	19.0	19.5	20.1	20.6	21.1	22.2	142
144	10.4	11.5	12.5	13.5	14.6	15.6	16.1	16.7	17.2	17.7	18.2	18.8	19.3	19.8	20.3	20.8	21.9	144
146	10.3	11.3	12.3	13.4	14.4	15.4	15.9	16.4	17.0	17.5	18.0	18.5	19.0	19.5	20.0	20.5	21.6	146
148	10.1	11.1	12.2	13.2	14.2	15.2	15.7	16.2	16.7	17.2	17.7	18.2	18.8	19.3	19.8	20.3	21.3	148
150	10.0	11.0	12.0	13.0	14.0	15.0	15.5	16.0	16.5	17.0	17.5	18.0	18.5	19.0	19.5	20.0	21.0	150

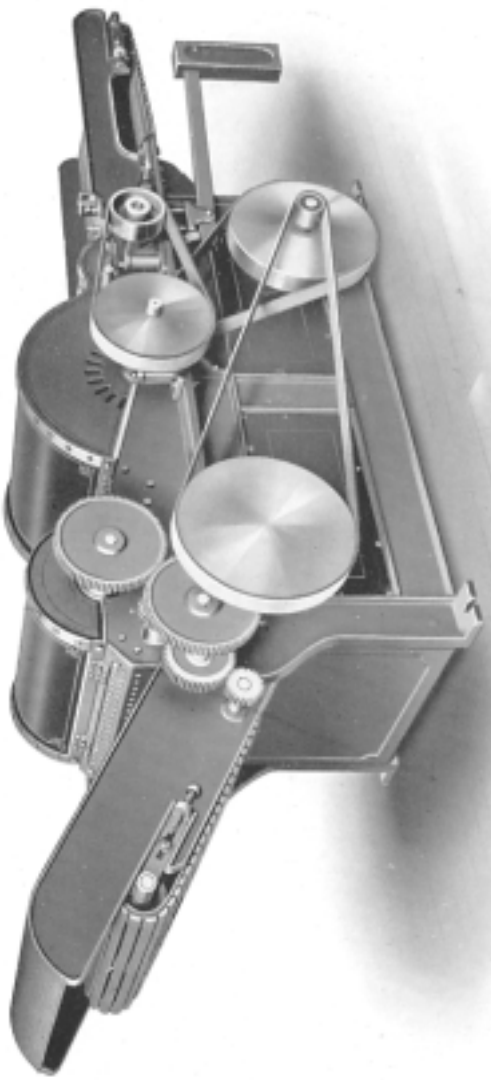
NOTE:—In the above tables, 10 per cent. of the time is allowed for changing shuttle, cleaning, oiling, etc.

Speeds of

Whitin Looms on Medium Weight Cloth.

Name of Loom.	Revolutions per minute.	Name of Loom.	Revolutions per minute.
28 in.	200 to 210	72 in.	116 to 120
30	195 " 200	74	114 " 116
31	190 " 195	79	112 " 114
32	185 " 190	80	110 " 112
34	180 " 185	81	108 " 110
36	175 " 180	82	106 " 108
38	170 " 175	88	104 " 106
40	165 " 170	90	102 " 104
42	160 " 165	92	100 " 102
44	154 " 158	98	98 " 100
46	150 " 154	99	96 " 98
50	142 " 148	100	94 " 96
54	140 " 144	101	92 " 94
56	138 " 140	107	88 " 90
60	132 " 136	108	86 " 88
66	126 " 130	124	75 " 80
70	120 " 124	150	65 " 70

Waste and Wool Machinery



Roving Waste Opener

ROVING WASTE OPENER

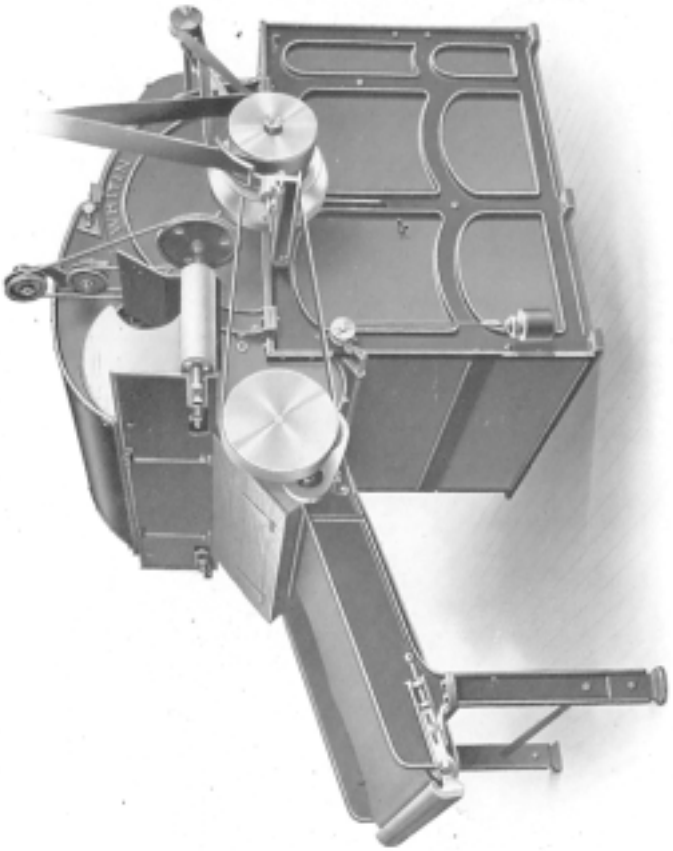
This Machine is used to open up roving or spinners' waste, preparatory to applying it at the back of our Roving and Spinners' Waste Card, either with an automatic feed or hand-feed. We do not guarantee it to open up the stock absolutely, but we do recommend it to prepare the stock for this carding operation, so that when the stock is taken from the card it is properly prepared for the Drawing Frame, and it goes forward from this point with the regular work. In this operation there is practically no shrinkage of the stock, as is the case in other methods of handling.

The Production is 500 to 600 pounds per day of 10 hours.
Speed of main cylinder 850 r. p. m. Size of pulleys 12″ x 2″
Horse Power: 4 horse power.
Belting Required:

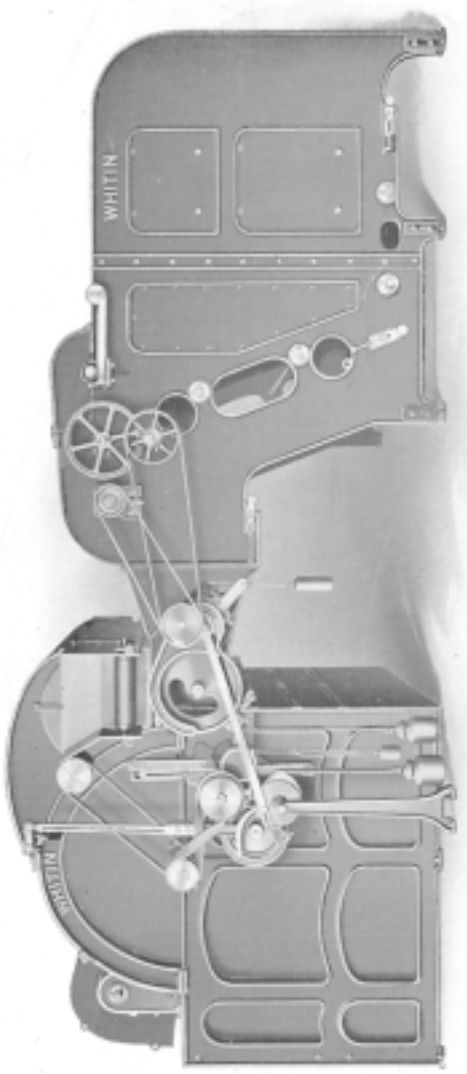
Licker-in belt 4′, 10″, of 2½″ belting
Cross shaft belt 5′, 10″ of 2½″ belting,
Delivery apron belt 10′, 0″ of 2½″ belting.

Extras: Longer Aprons.
Floor Space: 10′, 8″ x 3′, 0″.
Weights:

Net Weight 900 pounds.
Shipping Weight 1000 pounds.



Willow with Hand-Feed



Willow with Automatic Feed

WILLOW

This machine is well adapted for opening and cleaning short staple cotton and cotton waste such as picker droppings, card fly, strips, sweepings, etc. The dust and dirt is effectually removed and the fibre as discharged from the machine is in a thoroughly opened condition suitable for subsequent operation.

The machine is equipped either with a hand-feed or automatic feed as ordered.

A Rack Motion enables the operative to regulate the length of time the raw stock is operated upon and also means are provided to automatically open and close the inlet and discharge gates at proper intervals.

The Driving Pulleys are 16 inches in diameter by 4 inches face and should run 320 revolutions per minute.

The Production is 2500 to 5000 pounds per day of 10 hours.

The Power consumed is about 7 horse power.

Belting Required:

Feed apron belt 11′, 0″ by $2\frac{3}{4}$″ wide.
Fan belt 9′, $9\frac{1}{2}$″ by 2″ wide.
Regulator belt 4′, 10″ by 2″ wide.
Roll belt 6′, 4″ by $1\frac{1}{2}$″ wide.
Delivery apron band 15′, 0″ by $\frac{5}{8}$″ diameter.

Extras Required, Optional:

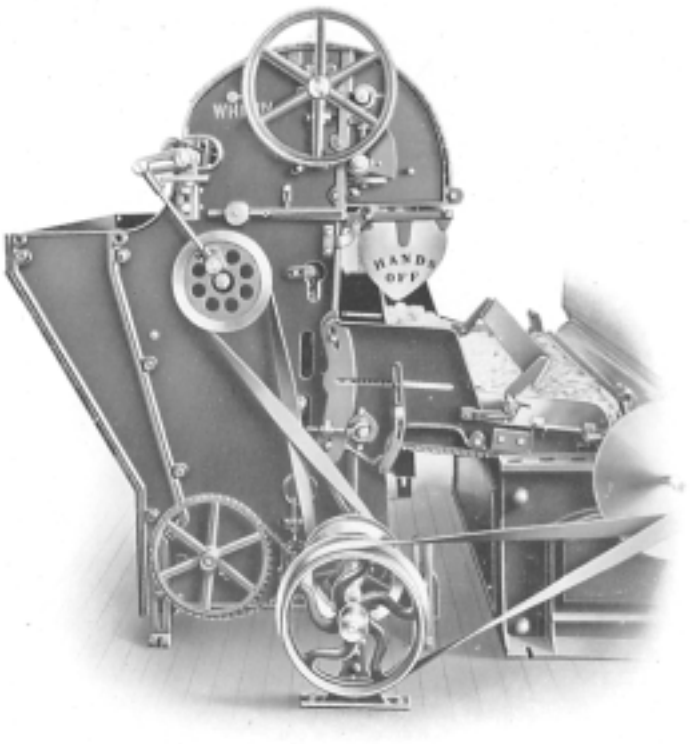
Fans and pipes for exhauster system.
Traveling aprons and conveyer system.

Floor Space:

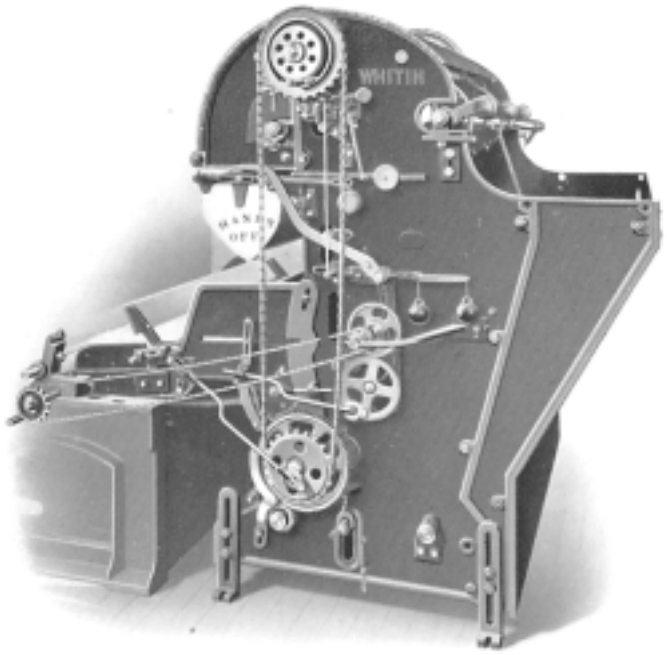
12′, 0″ by 7′, 10″ wide with hand feed.
16′, 10″ long by 7′, 10″ wide with automatic feed.

Weights: with hand-feed.

Net Weight 5500 pounds.
Shipping Weight 7000 pounds.



Automatic Feed
(Driving Side)



Automatic Feed
(Scale Side)

AUTOMATIC FEED

This Machine is used for feeding the stock to the breaker card, when pickers are not used, and it is recommended for the lower grades of stock, as it does not injure it, and gives as even a feed to the card as can be obtained, provided the machine is properly. adjusted.

The Production is equal to the production of the card to which it is attached.

Size of pulleys 14″ x 2¾″.

Horse Power: ¼ horse power.

Belting Required:

Cone belt 8′, 4½″ of 2½″ belting.

Doffer apron belt 9′, 4½″ of 1½″ belting.

Extras:

Scott's Compensator.

Feed Roll.

Floor Space:

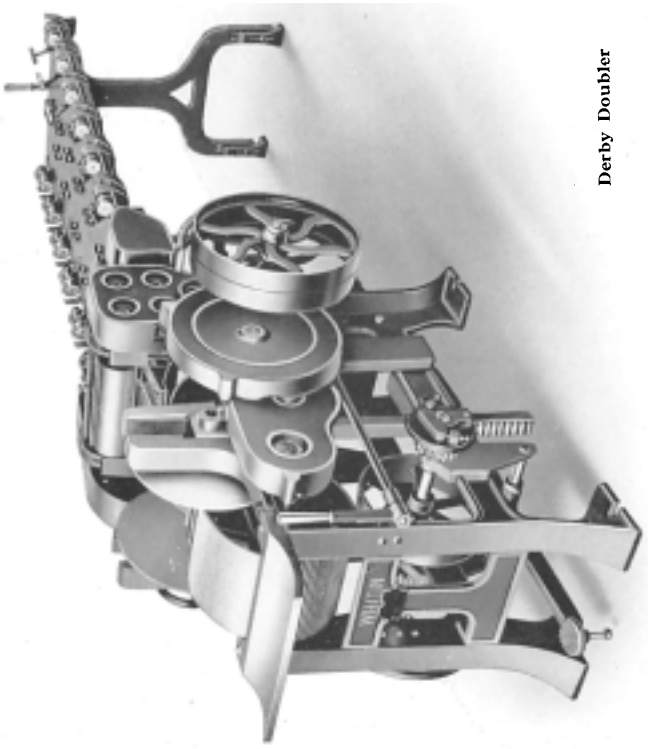
For 40″ Card 5′, 6″ x 4′, 6″.

We build these for 40″, 45″, 48″ and 51″ Cards.

Weights:

Net Weight 1100 pounds.

Shipping Weight 1200 pounds.



Derby Doubler

DERBY DOUBLER

This Machine, sometimes called a Sliver-Lap Machine, is designed to take from 16 to 40 card slivers and form them into a lap for the card or the combing machine.

When used for reclaiming purposes the machine is equipped with a draw-box, comprising four rolls so geared as to impart a slight draft to the sliver, whereas for the Double Carding process no draw-box is used, as draft is not required.

The machine is made to form laps of the following widths, as ordered $9\frac{3}{4}''$, $10\frac{1}{2}''$, $12''$, $19\frac{7}{8}''$, $22\frac{3}{8}''$ or $25\frac{3}{8}''$.

Driving Pulleys: $24''$ in diameter by $2\frac{1}{2}''$ face, and run one revolution to one of the $5''$ calender rolls.

Production:

With the waste reclaiming system at 75 r. p. m. of calender rolls, the machine will produce 840 pounds of laps weighing 400 grains per yard per day of 10 hours.

With double carding when used between Breaker and Finisher Cards, production at 40 r. p. m. is 3000 pounds per day of 10 hours.

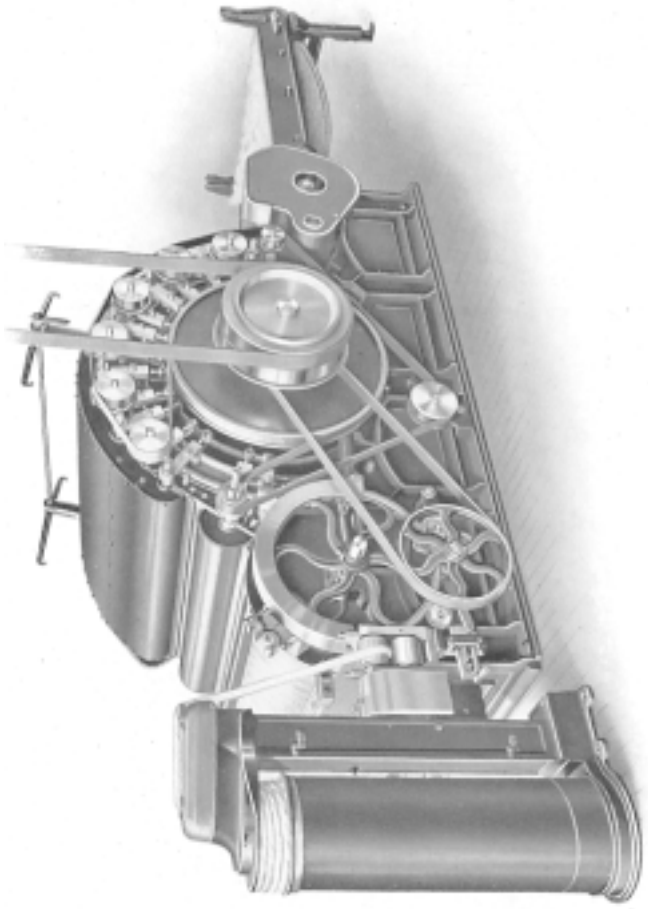
Power: $\frac{1}{2}$ horse power required.

Floor Space: Including 20, 12-inch cans, $10'$, $6''$ long by $4'$, $3''$ wide.

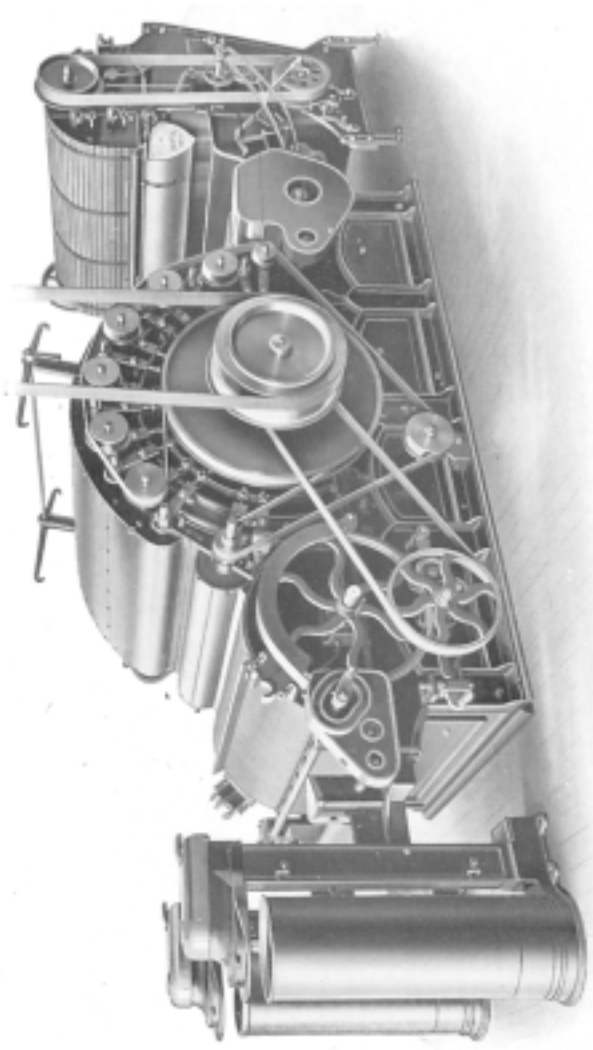
Weights:

Shipping Weight 2700 pounds.

Net Weight 2500 pounds.



Roving Waste Card with Single Coiler



Roving Waste Card, with Two Coilers and Automatic Feed

ROVING WASTE CARD

The Roving Waste Card is a machine that, after the stock is opened slightly, will convert it into sliver without waste, so that it can be taken from the front of the card and applied directly back of the Drawing Frame, whether it be combed or carded work.

We build the Roving Waste Card with either Single or Double Coiler Front, because in cases where coarse hanks are to be converted into sliver, the product of the machine is greater than when the roving is very fine: and if the product of the card is great, we recommend a double coiler front, for the purpose of making a light sliver rather than running a doffer at a high rate of speed.

The Production is 100 to 200 pounds per day of 10 hours.

Speed of Cylinder: 165 r. p. m.

Size of Pulleys: 20″ diameter by 3″ face.

Horse Power: About 2 horse power.

Belting Required:

Stripper and fancy roll belt 24′, 4″ of 2″ belting.
Doffer driving belt 11′, 0″ of 2″ belting.
Licker-in driving belt 9′, 0″ of 2″ belting.
Doffer comb and drive band 16′, 6″ of $\frac{3}{8}$″ banding,
Fancy roll clearer band 6′ 0″ or $\frac{3}{8}$″ banding.

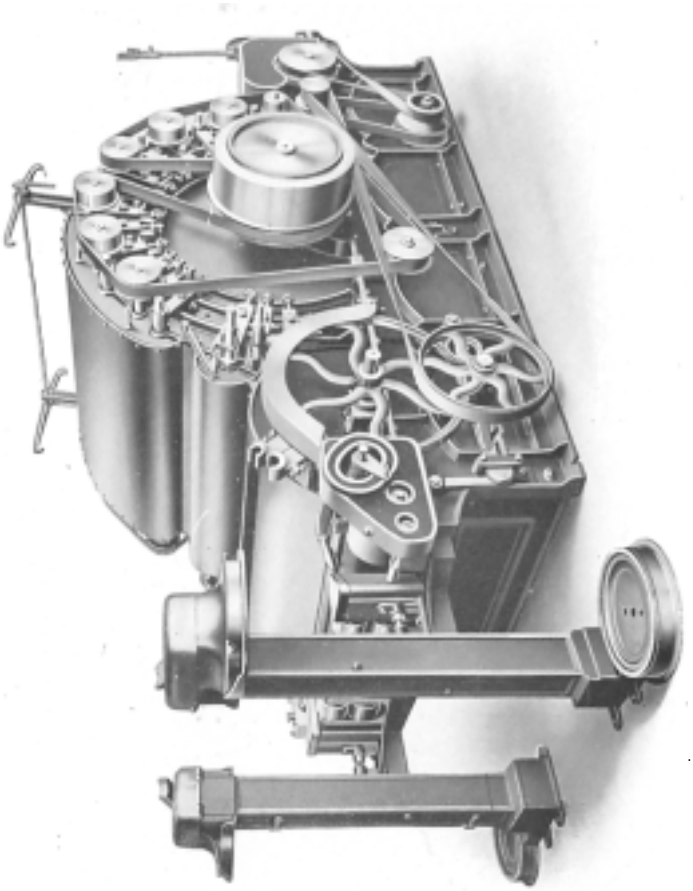
Extras Required:

Roving Cans,
Hand Apron Feed,
Belt Conveyer Front,
Double Coiler Front,
Automatic Feed.

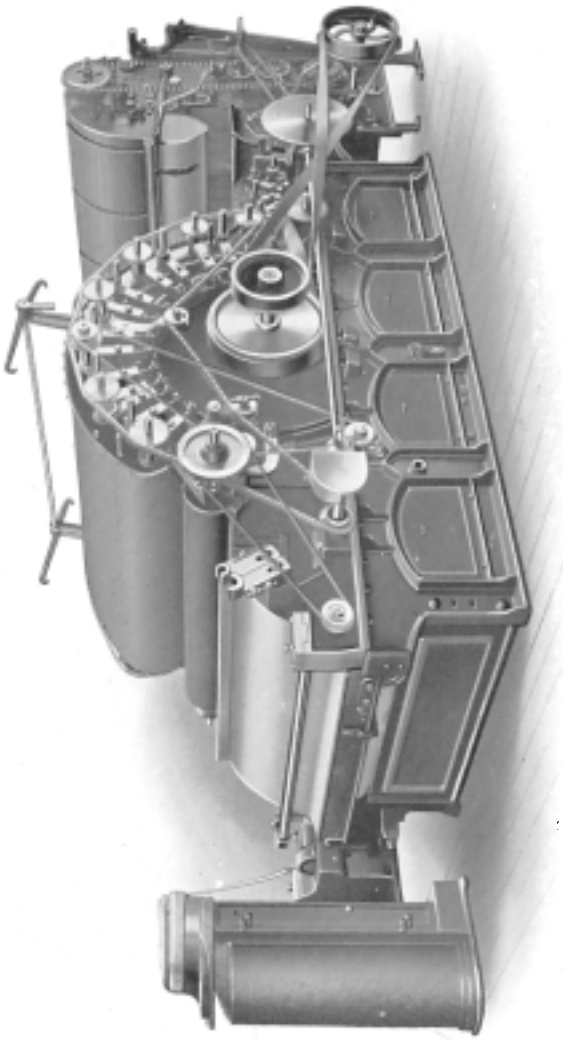
Floor Space: 17′, 9″ by 6′, 5″ for 45″ card.

Weights:

Net Weight 7750 pounds.
Shipping Weight 8950 pounds.



Breaker Full Roller Card, with Two Coilers



Breaker Full Roller Card, with One Coiler and Automatic Feed

BREAKER FULL ROLLER CARD

The Cards used for the condenser system are of the full roller type, with 50″ diameter cylinder and 27″ diameter doffer, furnished in widths of 40″, 45″, 48″ and 51″. The cylinders, perfectly balanced and ground to a true surface, run in removable bronze bushings set in heavy pedestals so designed as to prevent any overflow of oil from getting on the clothing of the cylinder.

The entire framework is substantial. The workers and strippers are of cast iron, balanced and ground to true surfaces. All shafts are of steel, and the fast-running shafts are case-hardened, insuring long life and perfect settings. All parts of the card are capable of easy and accurate adjustments.

All parts of the card are so inclosed that drafts are avoided, and no waste can accumulate within the frame except what is taken out under the screens. These screens are also special in their construction and arrangement, and are of easy adjustment.

The Breaker Cards are built for either lap or automatic feed; with or without metallic breasts; always with a fancy. If a doubler is used between breaker and finisher as on the coiler system the breaker is equipped with a double coiler front or with belt conveyer front and one coiler. When a cross-feed is used the sliver is taken directly from the breaker card and laid either straight or diagonally across the back of the finisher.

Production: 200 to 400 pounds per day of 10 hours.

Speed of Cylinder: 100 to 165 r. p. m., depending on the class of stock used.

Size of Driving Pulleys: 20″ x 3″, 24″ x 4″, or 30″ x 5″.

Power: From 1½ h. p. to 3 h. p., depending on speed and production desired.

Clothing: Depending on class of work and grade of stock to be run. Counts of wire and foundations to suit.

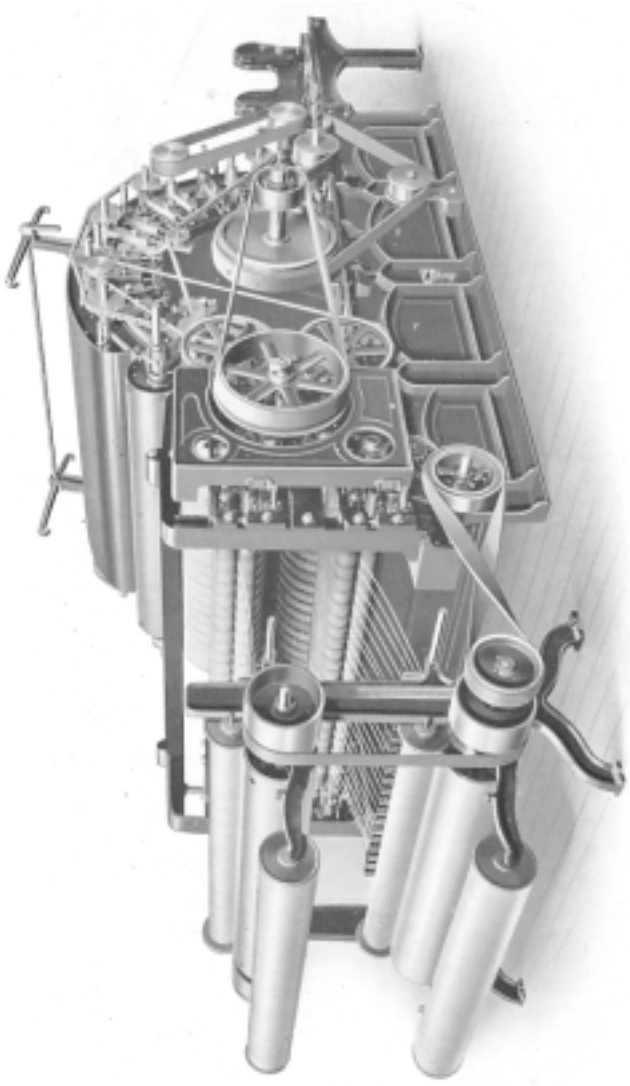
Supplies: Roving Cans.

Extras: Supplied as ordered.

Automatic Feed,
Double Lap Back,
Metallic Breast,
Belt Shipper.

Weights: 48″.

Net Weight 8200 pounds,
Shipping Weight 9500 pounds.



Finisher Full Roller Card with Double Bank Condenser

FINISHER FULL ROLLER CARD

The Finisher Cards are of the full roller type, similar in construction to the breaker card, with 50″ diameter cylinder in widths of 40″, 45″, 48″ and 51″. The arches and bearings are so constructed that very accurate settings can be made and retained. All rolls have shell ends. Metallic breasts can be applied to the finisher cards when desired, or when the class of stock requires them; and all finisher cards are equipped with a fancy roll. Where **Derby Doublers** are used, the finisher cards are built with either single or double lap backs, and the lap is taken directly from the lap head to the back of the card. When the Derby Doubler is omitted, a cross-feed is used, the cards being connected either tandem or parallel. The finisher card is built with either a single or double doffer. With a single doffer, the roving is delivered to a single-bank condenser, or to a four-bank tape condenser. Where the double doffer is used, the roving is delivered to a double-bank condenser, or under certain conditions, to a tape condenser. Each of these various methods of condensing and delivering the roving has its advantages, the style used depending on the conditions to be met.

Production: 175 to 300 pounds per day of 10 hours, depending on roving to be made and quality required.

Speed of Cylinder: 100 to 165 r. p. m., depending on stock to be carded.

Size of Driving Pulleys: Either 20″ x 3″, 24″ x 4″, or 30″ x 5″.

Power: 2 to 3 h. p., depending on speed and production.

Supplies: Jack Spools.

Extras:

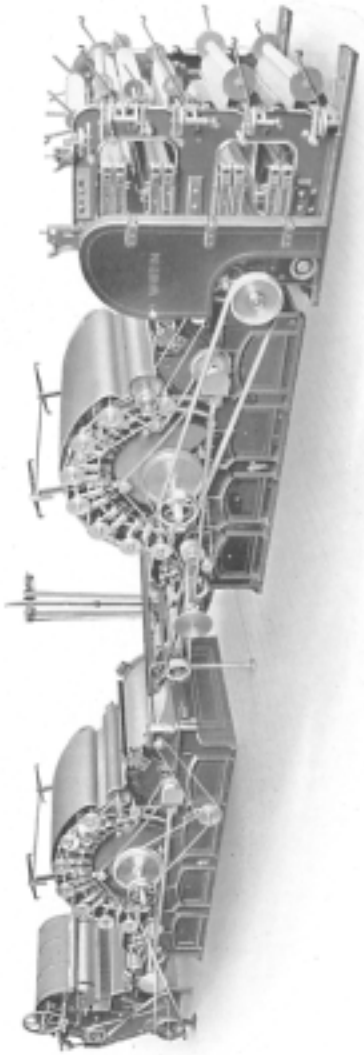
Double Lap Back,
Cross Feed.

Extras:

Tape Condenser,
Single Bank Condenser,
Two Bank Condenser,
Metallic Breast.

Weight:

Net Weight, 48″ card, 8200 pounds
Shipping Weight, 48″ card, 9500 pounds.



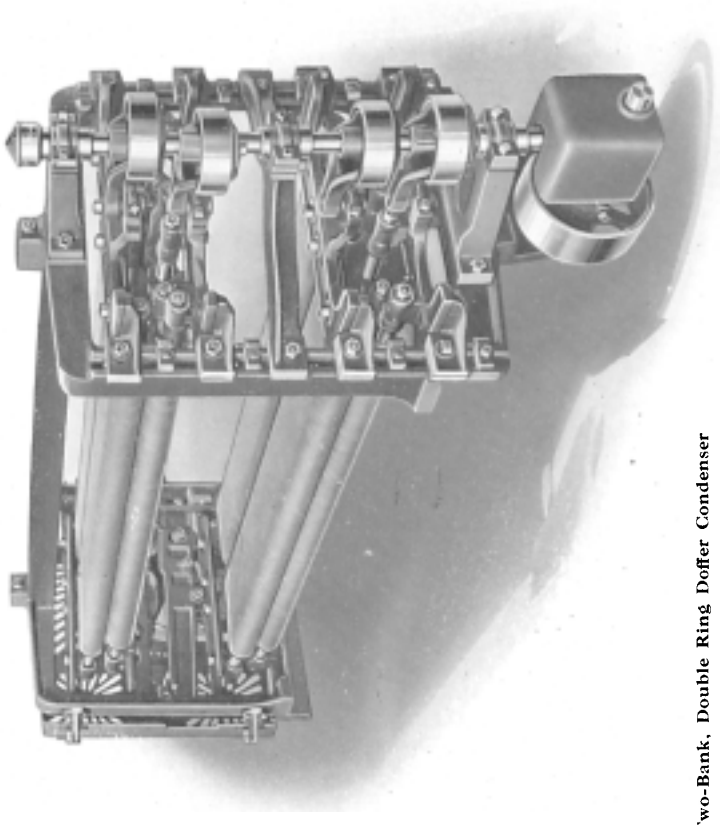
Two-Card Set

TWO-CARD SET

Carding of **Cotton Waste** by the condenser system is customarily done with **Two-Card Sets**, the cards being placed either tandem or side by side. In the set shown on the preceding page, the stock is fed to the breaker card by an automatic feeder which can be regulated to deliver the material evenly in any quantity desired. The breaker card is equipped with a metallic breast which helps break up any bunches and tends to save the card clothing. also, it so opens up the stock that, instead of allowing it to be drawn in in bunches, it delivers the material in a fleecy, even web in which condition it is best prepared for the card proper to do its work, ensuring large productions and first quality of work. The web is taken from the doffer on a belt conveyer front, through side calender rolls, and then by way of an overhead lattice apron to a cross-feed at the back of the finisher card. A diagonal feed may be had if preferred, but the lattice used with the cross-feed makes it feasible to use very short staple without the sliver breaking down. From the finisher card the web is carried to a four-bank **Tape Condenser** which separates and condenses it into from 80 to 96 good ends of roving, according to the class of work to be done. This type of condenser can make a much finer roving than the older types, with little variation in the size of the ends, and the spools of roving can be spun to comparatively fine numbers of waste yarn with very slight draft.

Both Breaker and Finisher Cards have a fancy roll, and all rolls have shell ends. The workers are chain-driven and the tops of the cards have substantial steel covers. The doffer comb motion which is run in oil, contained in an oil-tight comb box, can be driven at high speed without heat, noise or undue vibration.

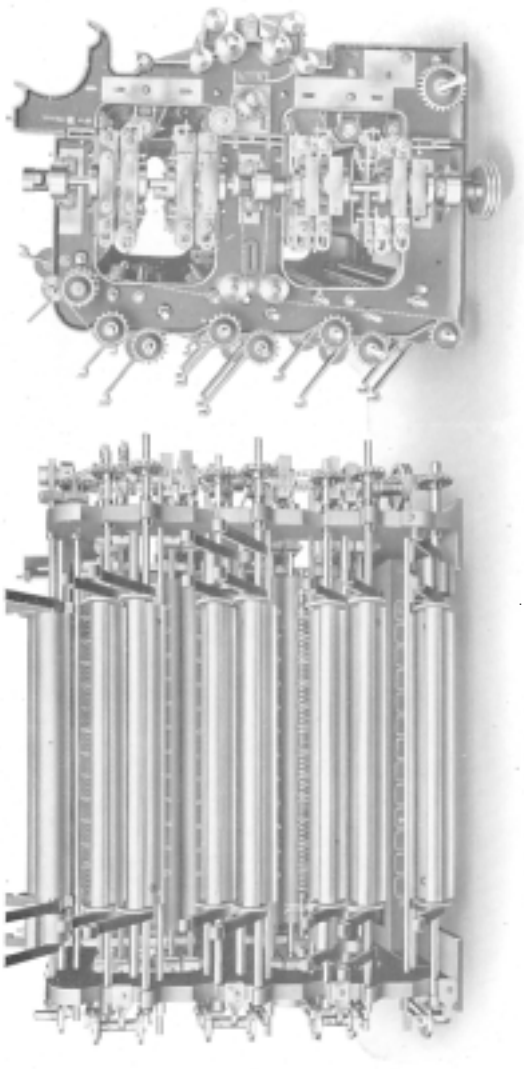
The Production of this set is from 175 to 300 pounds per day of 10 hours.



Two-Bank, Double Ring Doffer Condenser

TWO-BANK DOUBLE-RING DOFFER CONDENSER

This type of condenser has been used in this country for many years in connection with the woolen system for low grade cotton. The cotton is taken from two doffers clothed with rings of card clothing separated from each other by narrow strips of leather. These leather rings serve to divide the web into strips of equal width, which are kept separate and carried forward by a large grooved roll to be rubbed into roving by the condenser. The number of ends to be taken off can be determined by the width of the clothing rings put on the doffers, 24 to 30 good ends from each doffer or 48 to 60 ends to a 48″ card being a fair average. This is a standard type of machine and is preferred by many manufacturers for producing medium numbers.

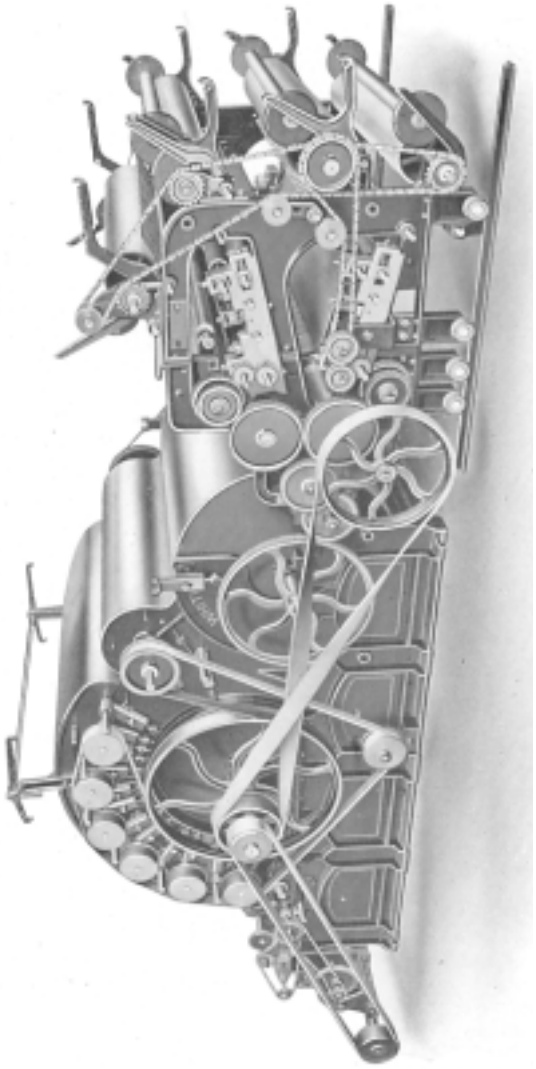


Four Bank Tape Condenser, arranged for Eight Spools

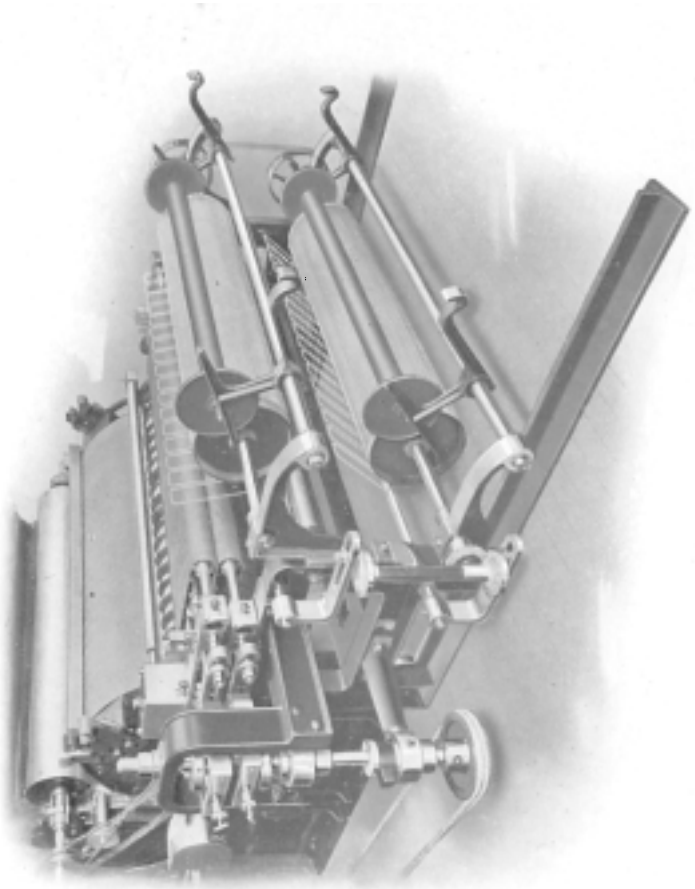
FOUR-BANK TAPE CONDENSER

The **Four-Bank Tape Condenser** is a modern and most successful machine for condensing roving, especially if the roving is to be spun into comparatively fine yarn. With this condenser the web from the card doffer passes between two grooved rolls, which separate the web into strips of exactly equal width, very much in the same manner that a piece of sheet steel is sheared by cutting rolls. The grip is not positive enough, however, to cut any individual fibres. Running in the grooves of both top and bottom dividing rolls are leather tapes to which the narrow strips of cotton web adhere as soon as they are separated. These tapes carry the web to the condenser rolls, which detach the web from the tape and rub it into roving, making from 80 to 96 good ends. The machine has been built to wind the roving on four, or eight spools, depending on the style of spinning frame following.

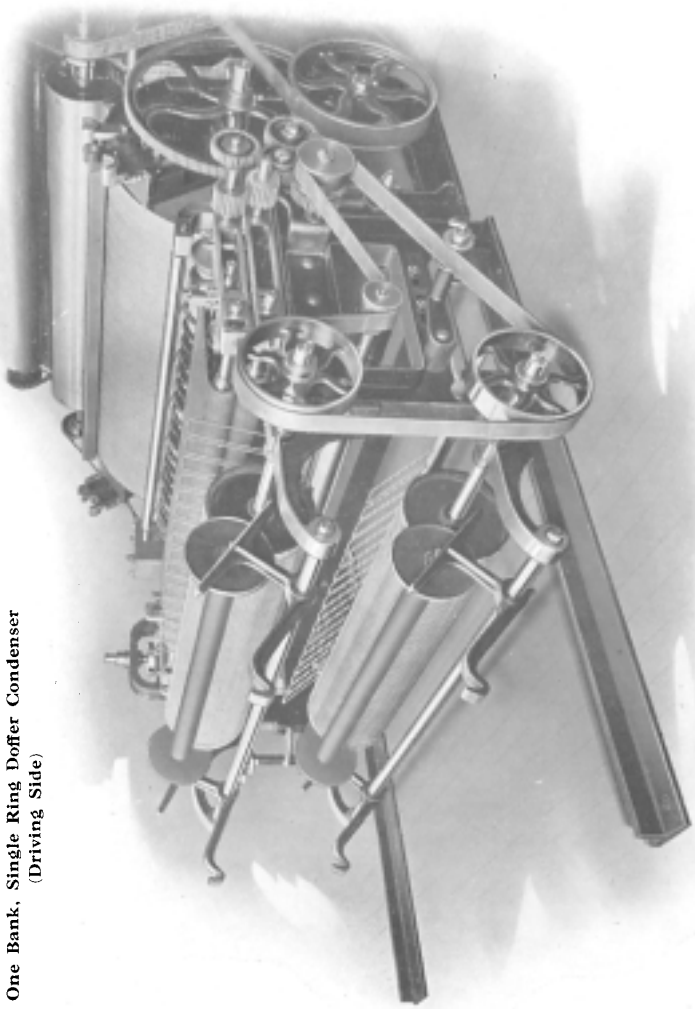
The method of separating the web on this condenser gives a very even roving, with little tendency to variation. It is also possible to make an unusually light roving, since other methods of condensing require that the strip of web from the doffer be strong enough to sustain its own weight. For the same reason it is possible to run very **Short Staple** because light roving can be spun with very little draft into fairly fine numbers of yarn.



Finisher Card with Model C Two-Bank Condenser



One Bank, Single Ring Doffer Condenser



One Bank, Single Ring Doffer Condenser
(Driving Side)

SINGLE-BANK, SINGLE-RING DOFFER CONDENSER

This Condenser is similar in operation to the double bank condenser, except that the regular 27″ single doffer is used in place of two small doffers on the double bank condenser. Also, the stock is carried by grooved rollers from the doffer to the condenser aprons. This machine is used very widely, particularly for a production of medium count yarns, and not over 42 ends to the 48″ width card is recommended. This machine particularly commends itself to coarse work, where the number of ends taken from the condenser are limited. It is a very popular arrangement, and in some cases the roving spool is taken directly from the condenser and placed in a special creel on a slubber, for the purpose of producing coarse yarns, either with or without draft.

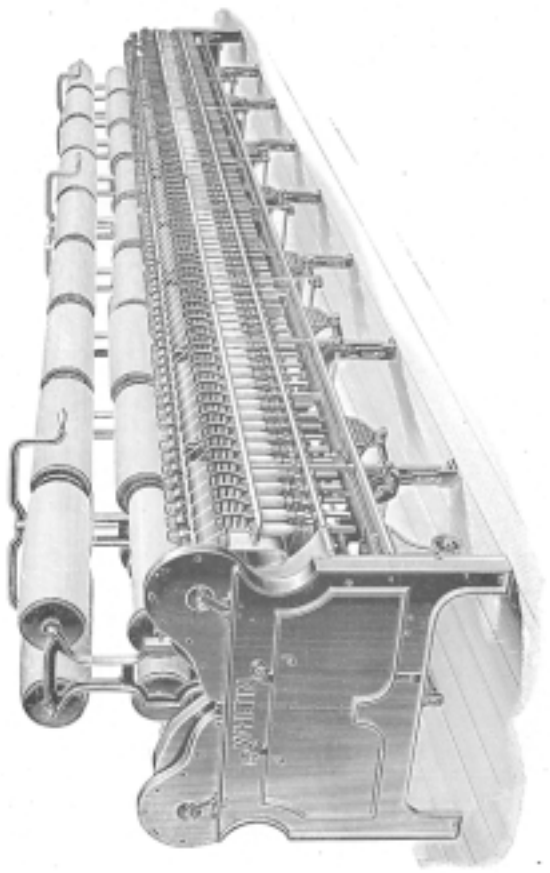
SPECIFICATION FOR FULL ROLLER CARDS

How many **Full Roller Cards**
What width Card
How many of each hand?
Belt Drive, or Motor Drive?
If Belt Drive, Driving Pulleys are 24″ x 3″.
If Motor Drive, state teeth and pitch of Receiving Gear?
Are Cards to be furnished in Sets?
If in Sets, how many in each Set?
How are Cards to be connected?
What kind of Stock will you use?
Automatic Feed, or Picker Lap?
Single or Double Lap Rolls?
If Double Lap Rolls are wanted, what kind?
Are Metallic Breasts to be applied?
Are Auxiliary Lickerins to be applied?
Are Scraper Doffers wanted?
What kind of Front is wanted?
If Coilers, how many?
What is diameter of Coiler Cans?
What is weight of Sliver or Roving?
Draft or Draft Gears?
Cross Feed or Derby Doubler?
How many Doffers on Finisher Card?
If Condensers, how many ends?
If Condensers, what kind?
Production per day of 10 hours?
Is Patent Stripping Box wanted?
Is Roll Grinder wanted?
How many Long Grinder Rolls wanted?
How many Traverse Grinder Rolls wanted?
If you have any preference as to Clothing, state foundation, counts and number of points.

Breaker Card, Cylinder?
Doffers?
Workers?

	Strippers?
	Lickerin?
	Scraper Doffers?
	Fancy?
Intermediate Card,	Cylinder?
	Doffers?
	Workers?
	Strippers?
	Lickerin?
	Scraper Doffers?
	Fancy?
Finisher Card,	Cylinder?
	Doffers?
	Workers?
	Strippers?
	Lickerin?
	Scraper Doffers?
	Fancy?
Card Connecting Rolls,	First Roll?
	Second Roll?

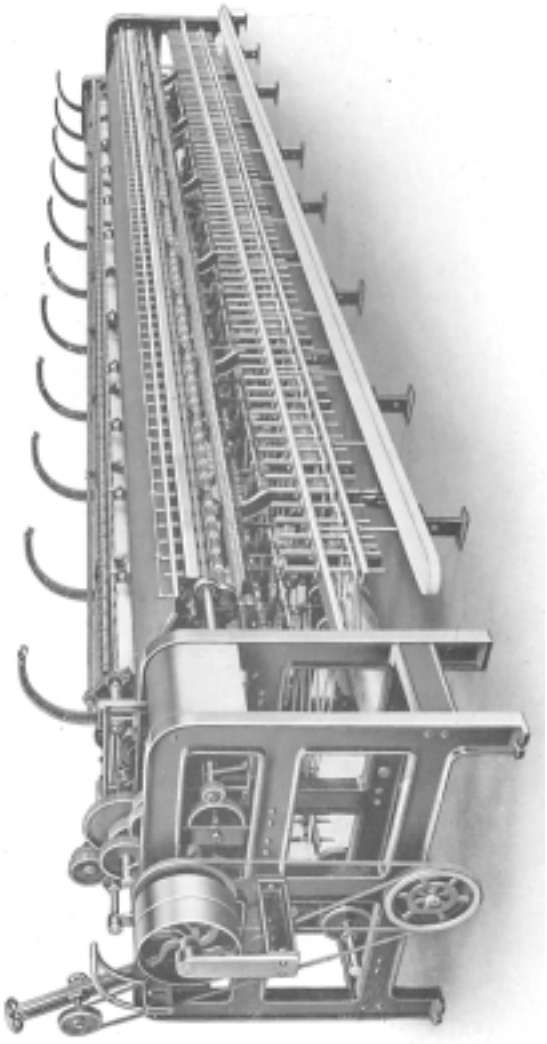
Cylinders of Full Roller Cards are 40″, 45″ and 48″ wide x 50 ″ Diameter.



Childs-Stewart Waste Spinning Frame

CHILDS-STEWART WASTE SPINNING FRAME

This Machine is designed particularly for the spinning of coarse yarns with no draft from oily cotton card waste, comber noils, shoddies, sweepings, linters or other low grades of stock. It is particularly suitable for spinning such yarns as filling yarns for blankets and flannelettes, hosiery yarns, backing yarns for carpets, woolen goods and shoddies. As compared with Mule Spinning, these yarns can be spun on this frame with a considerable saving in labor, investment and horse power. The roving is delivered direct to this spinning frame from the jack spools made on the Card Condensers. The spools are placed in the creel of the frame and are supported by drums whose rotation carries the roving forward to the delivery rolls with little or no draft. The yarn is then spun by means of spinning rings and travelers in the same way as on an ordinary cotton ring spinning frame. **Practically No Draft** is imparted to the yarn in this process, and the result is a lofty and soft thread. The twist can, however, be increased when necessary for the making of backing or hard, strong yarns. Owing to the novel construction of the threadboard and adjacent parts, the snarling of ends is prevented when an end breaks after leaving the roll, as the broken end falls directly into a trough below, out of the way of contiguous ends. The accumulation of waste in the trough is readily removed by the operative, when desired, without having to stop the machine. The width of the machine is 48″, and it is built in either 3″, 3½″ or 4″ space with from 160 to 220 spindles. The framework is designed to embody strength and rigidity with neatness of detail and accuracy of workmanship.



The Whitin Wool Spinning Frame

WOOL SPINNING FRAME

(Pease Patents)

For many years it has been the aim of numerous inventors to devise a machine for the **Continuous Spinning of Wool,** with the object in view of overcoming the serious disadvantages of small production, excessive floor space, and large labor costs, existing at present in the spinning of wool on mules.

After several years of unremitting study and experiment, at great expense, the efforts in this direction have been crowned with success in the invention of a **Continuous Ring Spinning Frame for Wool,** under the patents of which we are now manufacturing our so-styled **"Wool Spinning Frame."**

This frame has **Two Principal Features** of usefulness. While primarily it was designed for the spinning of **woolen yarn,** that is, rovings made on the woolen condenser card, it has been found to be equally applicable to rovings made on the same system from cotton or **Cotton Waste,** producing soft, full threads of low counts, with the least possible amount of twist, suitable for cotton blankets, robes, bedspreads, hosiery and knit goods, and, in fact, almost everything for which coarse counts of cotton yarn are used.

It is a well-established fact that the underlying principles of the mule are essential to give a sound thread from rovings made on a condenser card. All condenser roving is delivered to the spinning frame with a greater or less amount of uneven places in it. This consists of what is known as "twits" and bunches; and as the fibres from the condenser system are not laid parallel, the evening up of this unevenness can be more successfully accomplished by the introduction of twist during the drawing process. The effect of this is that the twist takes hold of the smaller places first at the expense of the thicker, so to speak, thereby holding these finer places, while the larger, softer parts of the roving are drawn down to a uniform size.

As will be seen by reference to the illustration of this frame, the roving spools from the condenser card are held between two parallel lines of drums, whose motion passes the roving to a pair of delivery rolls. It is then drawn over the deflector rod, through a twister tube, to the drawing rolls, and thence to the ring, and is wound on the bobbin in the usual way common to ring spinning.

In spinning yarns from **Cotton Waste** the draft between the delivery rolls and the drawing rolls is constant, and the process of drawing is materially aided by the twisting tube between the two sets of rolls, which imparts a false twist to the roving, and at the same time by means of two pegs on the top of the tube the roving is agitated during the drawing, which produces the same effect as is done by the slipping of the yarn off the spindle point in mule spinning.

Another Feature of this frame which enables yarns of soft twist to be spun is the traversing of the bolster rail, the ring rail being stationary, and consequently the traveler drag on the yarn is unvarying.

The Production depends upon the counts of yarn and class of material being spun. As compared with that of the mule it varies under different conditions from $1\frac{3}{4}$ to $3\frac{1}{2}$ times as much. The latter figure would apply to the spinning of fine warp yarns, and the former to the production of a very thick, soft twisted filling or knitting yarn.

The saving in **Floor Space**, as compared with the mule, is, of course, dependent upon the character of yarn spun. If it is a thick, soft yarn, the amount of space saved would not be more than 40%; but on fine counts, with a fair amount of twist (which all fine yarns necessarily have), the saving would reach as high as $\frac{2}{3}$ or $66\frac{2}{3}\%$. The actual over all dimensions of a 144-spindle frame, 4-inch gauge, would be 5 feet, 10 inches wide by 28 feet, 6 inches long. On a basis of two and one-half times greater spindle capacity, there would be in this above-mentioned area an equivalent of 360 mule spindles.

Pulleys: 14-inch diameter by 3-inch face, run 450 revolutions per minute.

Horse Power: About 30 spindles per horse power.

Weights:

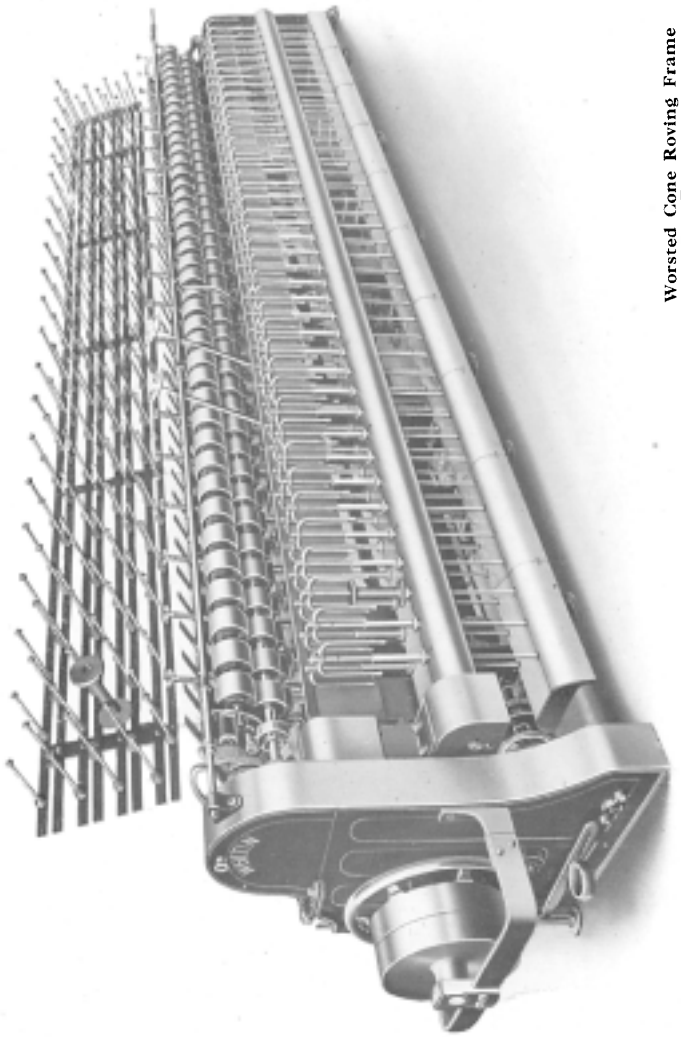
Shipping weight 350 pounds per foot.

Net Weight 270 pounds per foot.

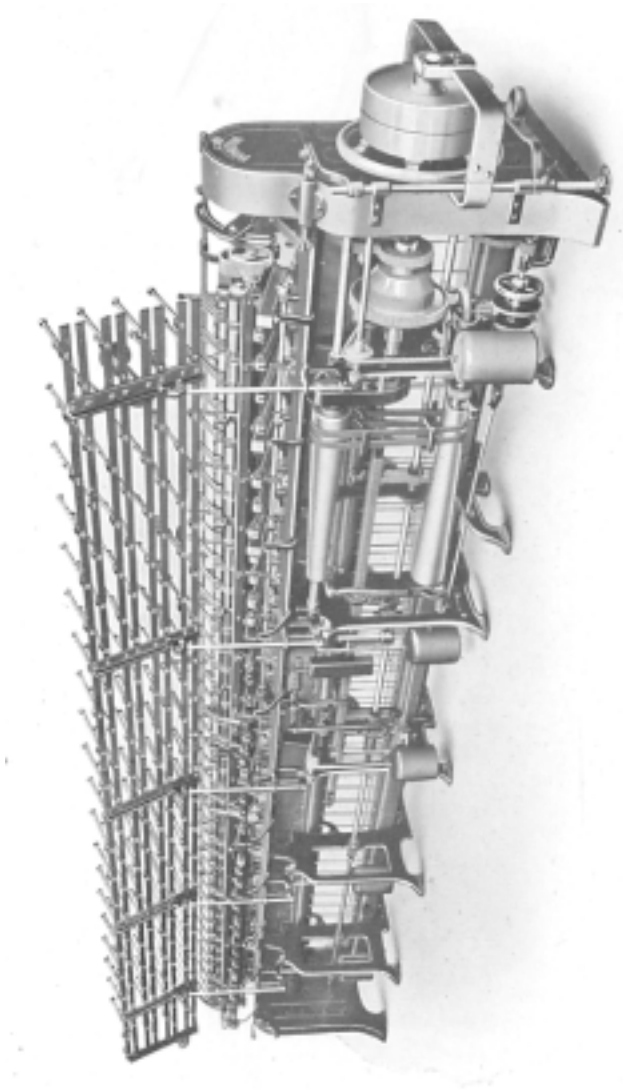
SPECIFICATION FOR WOOL SPINNING FRAMES

How many **Wool Spinning Frames?**
How many Spindles each?
What kind of Spindles?
Diameter of Whorl?
What Space between Spindles?
Inside Diameter, Flange and Depth of Rings?
Cast Iron or Plate Holders?
What size Holders?
Is Traveller Cleaner wanted?
What size Pulleys on Frames? Diameter and width of Face?
Are Frames to be belted from Above or Below?
Length of Condenser Drums?
Number of Ends on Jack Spools?
Are Top-Rolls to be covered?
What kind of Double Boss Drawing Rollers?
What kind of Twister Heads?

WORSTED ROVING



Worsted Cone Roving Frame
(Front)



Worsted Cone Roving Frame
(Back)

WORSTED CONE ROVING MACHINERY

Our line of Worsted Cone Roving Machinery includes Reducers, Slubbers, Intermediates and Fine Frames.

They are built of any number of spindles desired for bobbins of the following standard sizes:

12″ x 9″ x 13″ space, single line of flyers.
12″ x 6″ x 10″ " " " " "
12″ x 6″ x 10½″ " double " " "
10″ x 5″ x 10″ " " " " "
8″ x 4½″ x 7″ " " " " "
8″ x 4″ x 5½″ " " " " "
6″ x 3½″ x 5¼″ " " " " "

In addition to the above standard sizes, we can also furnish 8″ x 3½″ x 5½″ and 6″ x 3″ x 4½″ frames.

The design and construction of these frames combines simplicity and strength. They possess several advantages that are appreciated by all who have used them.

In theory, cone drawing differs from open or ordinary worsted drawing, solely in the methods of winding the sliver or roving on to the bobbin. The machine is usually built with two rows of spindles which do not require any extra floor space, so that the operatives are able to tend them with as much ease and comfort as the open drawing which has but one row of spindles.

There is no difference between the methods of drafting in the two systems.

The Twist, or relation of roller speed to spindle speed, is the same in principle, but the necessity of having a positive relation between the spindles and the bobbins in cone drawing makes it necessary to drive the spindles positively, and involves the use of bevel wheels instead of bands to drive them.

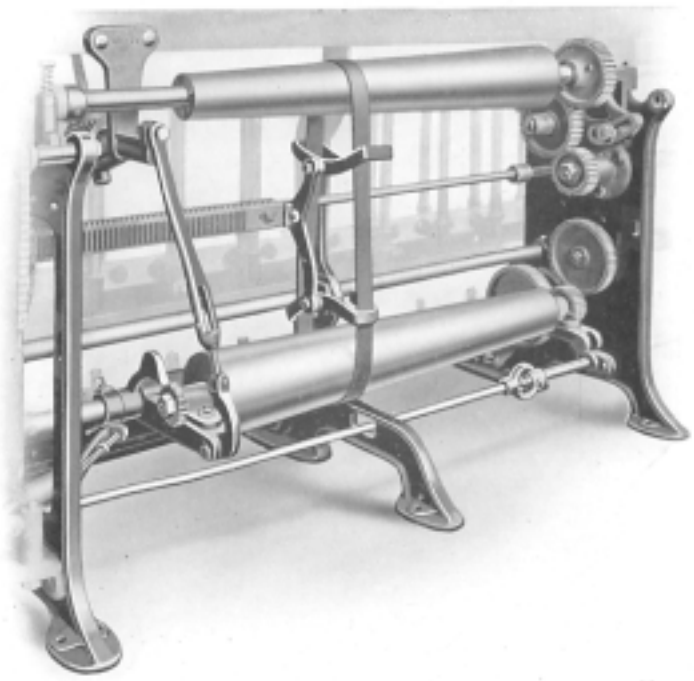
In both open and cone drawing the speed of the bobbin varies in relation to the constant speed of the spindles. This variation is not uniform at different parts of the bobbin, but is relative to the number of layers which have been wound on to the bobbin or, in other words, to the diameter of the roving on the barrel.

The essential difference between the two systems lies in the fact, that in open drawing the yarn after going through the eye of the flyer pulls the bobbin around and, in consequence, is always under a tension which requires extra twist to give it the proper strength to perform this duty. **Whereas** in cone drawing the bobbin is positively driven throughout the entire process of filling at speeds varying in relation to the diameter of the roving upon the bobbin, so that the sliver may run all the time without any drag whatever. It is also possible to build a larger bobbin of fine roving on the cone roving system, because on the open system the drag or strain constantly breaks down the roving or necessitates putting in so much twist that the production is greatly reduced.

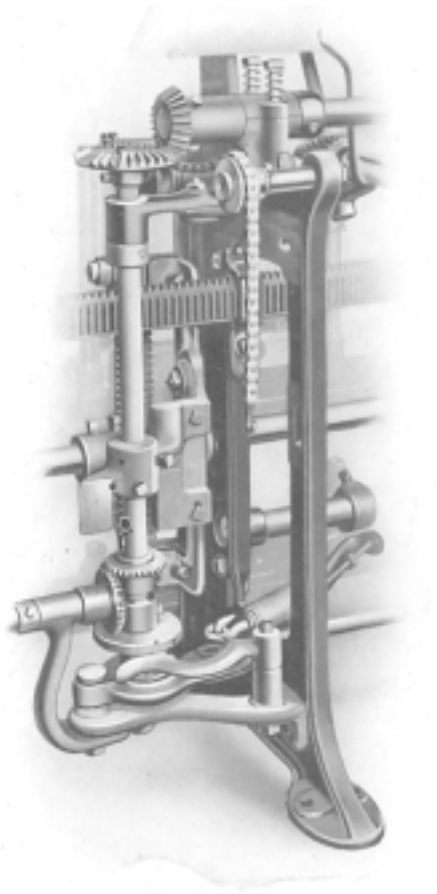
In the succeeding pages we enumerate some of the particular features of the frame which have contributed to its success.

The Frames are built specially heavy. All parts which are fitted together are milled and machined on templates or jigs, so as to be interchangeable as regards repairs and securing an especially strong structure when fitted together.

The Differential motion is the well-known Holdsworth type, which, of all the many motions on the market, has best survived the hard service of the cotton mills. It is simple and effective, and always runs in perfect balance. Its reliability has been well proven by over forty years of continuous service.



Cone Belt Motion



Worsted Builder Motion

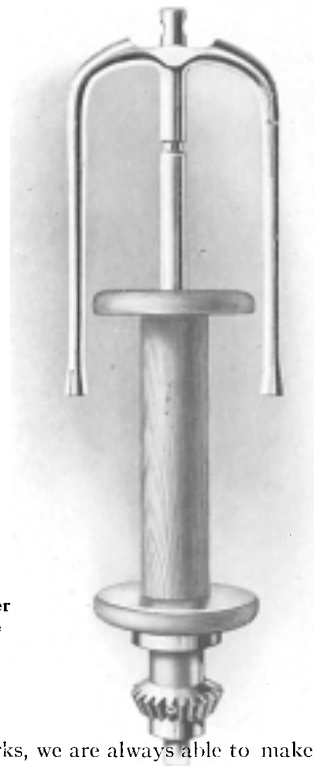
The Outlines of the Cones are determined by careful mathematical computations for all sizes of bobbins. The bottom cone is held in a swinging frame, maintaining an even tension on the belt.

This regulating device, as well as the means for winding back the cone belt when the bobbins are full, is readily operated from the front of the frame. The construction of the cone on its shaft is particularly substantial and slippage is absolutely prevented by the pins and keys. It is always possible to remove the top cone and shaft from the frame quickly and readily, without disturbing the other parts of the machine. The cone is also so centred as to run perfectly true under all conditions of work.

If desired, we can also furnish cones with cork inserts. These give the cone belt a better grip and absorb any surplus oil.

The Bottom Drawing Roll bosses are made of the best cast iron, ground to the proper diameter and irregularly fluted to avoid cutting the covering of the top-rolls.

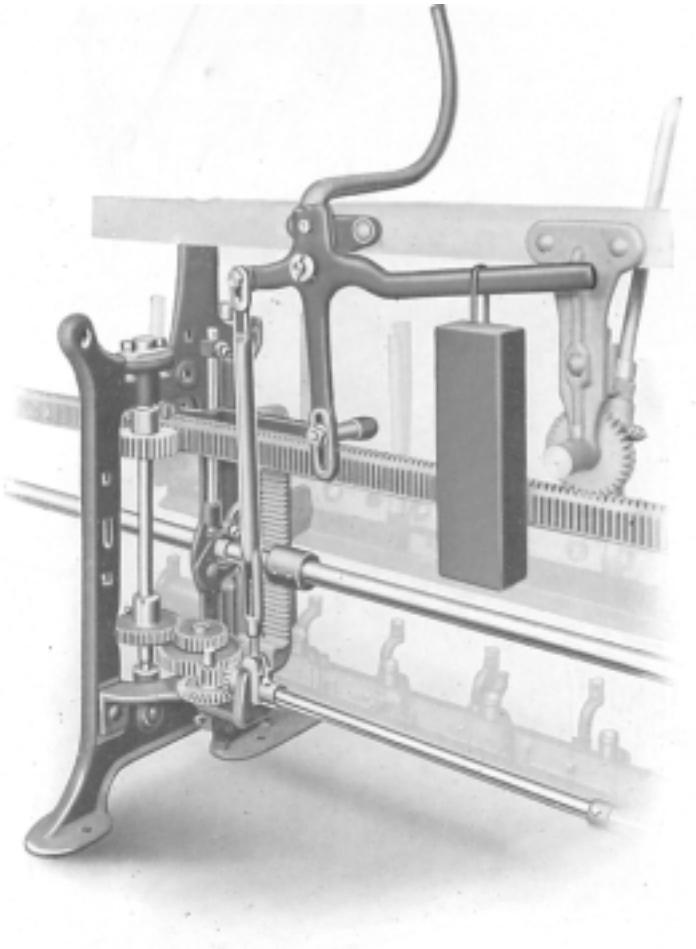
Top-Rolls are cast iron, forced on a case-hardened shaft. This minimizes the amount of wear at the saddle bearings and trunnions, and insures a long life to the roll.



Worsted Flyer and Spindle

The Spindles furnished are made from crucible steel accurately ground to size, and thoroughly tested, so as to insure perfect running without vibration. The bolsters are also so arranged as to sustain high speeds, being interlocked on the bolster rail.

The Flyers are of the well known double hollow leg type with hardened steel tips at bottom that may be replaced when worn. They are also made by special processes, with the best quality steel; they are evenly balanced at high speeds, are light in weight, and run free from vibration with their supporting spindles. By making and furnishing these flyers from our own works, we are always able to make quick deliveries, on odd sizes, and meet special requirements.



Worsted Frame Stop Motion

Casing Covers, of stiff cold-rolled steel, highly polished, give a superior finish to the machine, and being unbreakable require no outlay for repairs.

The Creels furnished with the machines are of the suspended, table or cotton style, and arranged to meet all conditions.

A Hank Clock, for registering the number of hanks delivered, is applied at the foot end of each frame, if desired.

The Driving Pulleys are 16″ in diameter by 2″ and 2½″ face. The loose pulley runs on a sleeve, which is integral with the yoke box supporting the driving shaft. When the belt is on the tight pulley the loose pulley does not revolve, thus reducing the wear of pulley bearing.

Cone Belts:

Reducer 12″x 9″	5 feet	6 in. long.
Slubber 12″ x 6″	5 "	6 " "
Intermediate 10″x 5″	4 "	10 " "
Roving 8″x 4″ and 8″x 4½″	4 "	8 " "
Jack Frame 6″x 3½″	4 "	6 " "

A Full-Bobbin Stop-Motion is applied. It can be set to knock off at any diameter of bobbin, and, when so set, the frames cannot be re-started without winding back the cone belt.

A Safety Stop-Motion is also applied, which prevents breakage to the machine in case the reverse motion fails to work properly.

The Main Roller Stands and back drop roller stands are arranged with removable bronze bearings that are readily replaced when worn out.

The Rack of the main roller stand is suitable for any length staple wool.

Weight of frames per foot in length.

Shipping weight	370 pounds
Net weight	330 "

Car Load: Three frames, boxed.

SPECIFICATION FOR WORSTED WOVING FRAMES

How many **Worsted Roving Frames**?
What Process?
How many Spindles each?
Size of Bobbin?
What Space between Spindles?
Are Spindles to be our regular size?
Are Bobbin Gear Collars to be our regular size?
How many Right Hand?
How many Left Hand?
Hank or Dram Roving to be made?
Dia. and Face of Front Bottom Roll Bosses?
Dia. and Face of Back Bottom and Drop Roll Bosses?
Dia and Face of Front Top-Roll Bosses?
Dia. of Front Top Roll Arbors?
Dia. of Saddle Bearing, Front Top-Roll Arbors?
Dia. of Trunions, Front Top-Roll Arbors?
Dia. of Bottom Carrier Rolls?
Dia. of Front Top Carrier Rolls?
Dia. of Back Top Carrier Rolls?
Back Roll Carrier Gear?
Front Roll Gear in Head End?
Top Cone Shaft Gear in Head End?
Draft?
Crown Gear?
Draft Gears?
Front Roll Gear?
Back Roll Gear, Draft Train?
Twist per inch?
Twist Gears?
Traverse Gears?
Tension Gears?

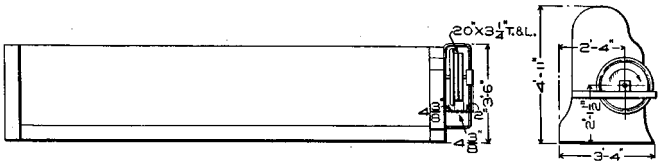
Style of Creel?
Creel for what size Bobbin?
Size of Pulleys? Diameter and width of Face?
Belt from Above or Below?
Length of Ratch for Roll Stand?
Front Top-Roll Springs?
Back Drop Roll Springs?
What size Cones?
Is Safety Stop Motion wanted at Foot End?

Note—If these machines are **Not** to match machines built by the Whitin Machine Works or the Providence Machine Co., and are to match machines built by some other machinery builder, please send us sample Spindle, Bolster, Bobbin Gear and Bobbin.

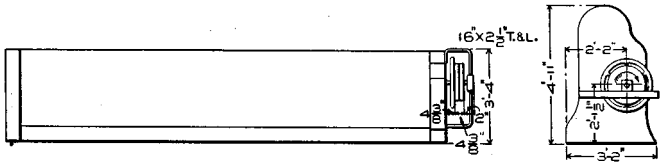
We allow three change gears each for Draft, Twist, Tension and Traverse, also spare Front Top-Rolls for 2 Heads.

Machines will be painted **Black** unless otherwise specified.

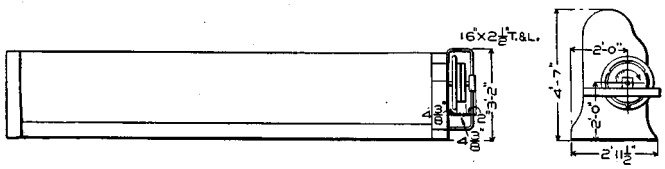
FLOOR PLANS
WHITIN WORSTED CONE ROVING FRAMES.



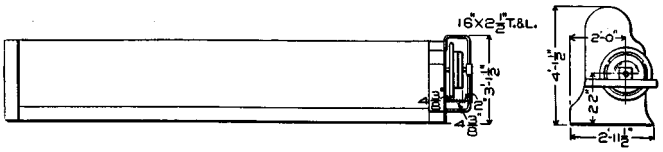
REDUCER.



SLUBBER.



INTERMEDIATE FRAME.



FINE FRAME.

WHITIN WORSTED CONE ROVING FRAMES

Lengths Over All

Frames	Reducer		Slubber		Slubber		Int'rm'de		Roving		Roving		Jack	
Full Bobbin	12″ x 9″		12″ x 6″		12″ x 6″		10″ x 5″		8″ x 4½″		8″ x 4″		6″ x 3½″	
Space	13″		10½″		10″		10″		7″		5½″		5¼″	
Line of Flyers	Single		Double		Single		Double		Double		Double		Double	
No. Spindles	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
8	12	0												
10	14	2												
12	16	4												
20					20	0								
24			13	10	23	4	13	4						
26					25	0								
28			15	7	26	8	15	0						
30					28	4								
32			17	4	30	0	16	8						
34					31	8								
36			19	1	33	4	18	4						
38					35	0								
40			20	10	36	8	20	0						
42					38	4								
44			22	7	40	0	21	8						
46					41	8								
48			24	4	43	4	23	4					13	9
52							25	0						
56							26	8	19	7	16	1	15	6
60							28	4	20	9				
64									21	11	17	11	17	3
68									23	1				
72									24	3	19	9	19	0
76									25	5				
80									26	7	21	7	20	9
84									27	9				
88									28	11	23	5	22	6
92									30	1				
96									31	3	25	3	24	3
104											27	1	26	0
112											28	11	27	9
120													29	6
128													31	3
Face Pulley	3¼″		3¼″		3¼″		3¼″		2⅝″		2⅝″		2⅝″	
Widths	3′–6″		3′–4″		3′–4″		3′–2″		3′–1½″		3′–1½″		3′–1½″	

MISCELLANEOUS

Repairs.

We have issued ror the convenience of users of our machinery, **Illustrated Circulars of the Component Parts** of each machine which we build. The various pieces are illustrated in a clear manner, numbered and named, so that if the directions for ordering repairs, as stated in circulars, are followed there will be no doubt but what the orders will be correctly filled, with the least possible delay. Copies of these circulars have been sent to all our customers, and extra copies will be sent on application.

The Hands of Machines.

To determine the **Hands** of our **Machines,** face the delivery and note which hand side the driving pulleys are.

Shipping Directions.

We prefer our customers to furnish directions for shipping their orders, but if not given and the package is small, we send by express, if large by freight, selecting the most reliable routes and the lowest freight rates that can be secured.

GROSS WEIGHTS AND CUBIC FEET FOR EXPORT OF WHITIN MACHINES

	Gross Weight	Cubic Feet
Bale Breaker,	6,000	200
Automatic Feeder,	2,165	100
1 Beater Breaker Lapper,	12,000	200
1 Beater Finisher Lapper,	8,000	150
40″ Revolving Top Flat Card	8,800	325
Full Roller Card,	10,000	500
1 Set Grinding Tackle,	500	20
Sliver Lap Machine,	3,200	60
Ribbon Lap Machine,	4,500	75
Eight Head Comber,	6,000	125
Drawing Frames per delivery,	900	15
Roving Frames, Weighted Rails, per foot,	480	12
Roving Frames, Self Balanced Rails, per foot,	384	8.5
Spinning Frames, per foot,	318	7.5
Wool Spinning Frames, 144 Spindles,	11,500	500.
Twisters, per foot,	318	7.5
Quillers, 378 Spindles,	4,300	75
Looms, 33″ Plain,	1,820	117

ESTIMATES

To anyone contemplating textile manufacturing or changes in their present plants we would be pleased to discuss their requirments, furnish estimates of machinery and costs of new mills or reorganizations of old mills. When making inquiries of this character give us as full a description as possible of what is desired, the following general particulars are essential.

1. The kind of cotton or fibre to be used.
2. The number of yarn to be spun.
3. A sample of cloth if possible.
4. Picks per inch of cloth to be woven.
6. Width of cloth.
7. Production per day of ten hours.

YARN STANDARDS

Cotton, woolen, worsted, linen, jute and silk yarns, are not graded on one common basis, as to number.

The present standards liable to be brought to the attention of the American manufacturer, are:

RUNS

The Run is used in New England very generally, and in some other sections of the United States and Canada considerably, for numbering woolen yarns.

1,600 yards per pound = No. 1; hence 100 yards per ounce = No. 1, and the number of hundreds of yards per ounce is the number of yarn, or the number of times 1,600 yards is contained in a pound of yarn.

COTTON NUMBER OR HANK

This standard is universal in England, the United States and Canada.

This hank is 840 yards, and the number of such hanks in 1 lb. avoirdupois is the count of the yarn. The same scale is used for Patent Silk. 2/40's Cotton means single 40's doubled to 20's; but 2/40's Patent Silk (better written 40/2 for distinction) is single 80's doubled to 40's.

WORSTED NUMBER OR HANK

Also universal in England, United States and Canada.

The hank is 560 yards, and the number of such hanks in 1 lb. is the count of the yarn.

Woolen Cut or Linen Lea

The Cut is used in Philadelphia and vicinity principally, but considerably elsewhere in the United States, for grading woolen yarns.

The Lea is used in Linen.

The Cut, Hank or Lea is 300 yards, and the number of such Cuts or Leas per pound is the number of the yarn. In Linen a Spindle is 48 leas or 14,400 yards. A bundle is 200 leas or 60,000 yards.

French System

The *French* system of numbering is based on the metric system (one metre = 39.37 inches), which is their standard of length, and the kilogram (one kilo = 2.2047 pounds) is their standard weight; in numbering yarn accordingly a thread of cotton yarn 1,000 metres long, weighing 500 grammes (half a kilogram), is called No. 1.

No. 2 =	2,000	metres	weighing	500	grammes.
" 3 =	3,000	"	"	500	"
" 4 =	4,000	"	"	500	"
" 30 =	30,000	"	"	500	"

This length of 1,000 metres is termed a hank (or écheveau), and each hank is divided into ten skeins (échevettes) of 100 metres each, these skeins are wrapped on a reel having a circumference of metres 1.425, making seventy revolutions.

It follows, from the above, that the count indicates the number of hanks required to weigh 500 grammes.

RULE.—Divide the metres reeled by twice the weight in grammes = counts French.

TO REDUCE FRENCH COUNTS TO ENGLISH multiply the French yarn No. x 1.18 = the English count sought.

TO REDUCE ENGLISH TO FRENCH NOS. divide the English counts by 1.18 = the French count sought.

Table Giving the Comparative Numbers of French and English Counts.

French Counts.	English Counts.	French Counts.	English Counts.	French Counts.	English Counts.	French Counts.	English Counts.	French Counts.	English Counts.
1	1.18	17	20.1	46	54.3	78	92.—	150	177.—
2	2.36	18	21.2	48	56.6	80	94 4	160	189.—
3	3.54	19	22.4	50	59.—	82	96.8	170	201.—
4	4.72	20	23.6	52	61.4	84	99.2	180	212.—
5	5.90	22	26.—	54	63.7	86	101.5	190	224.—
6	7.08	24	28.3	56	66.1	88	103.8	200	236.—
7	8.26	26	30.7	58	68.4	90	106.2	210	247.8
8	9.44	28	33.—	60	70.8	92	108.6	220	260.
9	10.6	30	35.4	62	73.1	94	110.9	230	271.4
10	11.8	32	37.8	64	75.5	96	113.2	240	283.—
11	13.—	34	40.1	66	77.9	98	115.6	250	295.—
12	14.2	36	42.5	68	80.2	100	118.—	260	307.—
13	15.3	38	44.8	70	82.6	110	130.—	270	318.6
14	16.5	40	47.2	72	84.9	120	141.6	280	330.—
15	17.7	42	49.6	74	87.3	130	153.—	290	342.2
16	18.9	44	51.9	76	89.7	140	165.—	300	354.—

Table Giving the Comparative Numbers of English and French Counts.

English Counts.	French Counts.	English Counts.	French Counts.	English Counts.	French Counts.	English Counts.	French Counts.	English Counts.	French Counts.
1	0.847	17	14.40	46	38.96	78	66.07	150	127.05
2	1.693	18	15.25	48	40.66	80	67.76	160	135.52
3	2.540	19	16.09	50	42.35	82	69.45	170	143.99
4	3.388	20	16.94	52	44.04	84	71.15	180	152.46
5	4.235	22	18.63	54	45.74	86	72.84	190	160.93
6	5.082	24	20.33	56	47.43	88	74.54	200	169.40
7	5.929	26	22.02	58	49.13	90	76.23	210	177.87
8	6.776	28	23.72	60	50.82	92	77.92	220	186.34
9	7.623	30	25.41	62	52.51	94	79.62	230	194.81
10	8.470	32	27.10	64	54.21	96	81.31	240	203.28
11	9.313	34	28.80	66	55.90	98	83.01	250	211.75
12	10.16	36	30.49	68	57.60	100	84.70	260	220.22
13	11.01	38	32.19	70	59.29	110	93.17	270	228.69
14	11.86	40	33.88	72	60.98	120	101.64	280	237.16
15	12.70	42	35.57	74	62.68	130	110.11	290	245.63
16	13.55	44	37.27	76	64.37	140	118.58	300	254.10

English Measure and Weights Reduced to French.

TROY WEIGHT

Grain	=0.064 grammes
Pennyweight (24 grs)	=1.555 "
Ounce (20 dwt.)	=31.103 "
Pound (12 oz.)	=0.373 kilogrammes

AVOIRDUPOIS WEIGHT

Dram	=1.117 grammes
Ounce (16 dr.)	=28.349 "
Pound (16 oz.)	=0.453 kilogrammes
Quarter (28 lbs.)	=12.695 "
Hundredwt. (112 lb.)	=50.802 "
Ton (20 cwt.)	=1016.048 "

MEASURE OF CAPACITY

Pint	=0.567 litres
Quart (2 pints)	=1.135 "
Gallon (4 quarts)	=4.543 "
Peck (2 gallons)	=9.086 "
Bushel (4 pecks)	=36.347 "
Sack	=1.090 hectolitres
Quarter (8 bushels)	=2.907 "
Load (5 quarters)	=14.539 "

LONG MEASURE

1 inch	=2.539 Centimètres
1 Foot	=30.479 "
3 Feet (1 yard)	=0.914 Mètres
Fathom (2 yards)	=1.828 "
Pole ($5\frac{1}{2}$ yards)	=5.029 "
Furlong (220 yards)	=201.164 "
Mile (1760 yards)	=1609.314 " or 1.609 kilomètrs

SUPERFICIAL MEASURE

Square inch	=6.451 Centimètres carres
" foot	=0.092 Mètre "
" yard	=0.836 " "
Rod	=25.291 " "
Rood (1210 sq. yds.)	10.116 Ares
Acre (4840 sq. yds.)	=40.467 "
Square mile	=2.588 Kilomètres carres

SOLID MEASURE

Cubic inch	=16.386 Centimètres cubes
" foot	=0.028 Mètre cube
" yard	=0.764 " "

French Measures and Weights Reduced to English.

LONG MEASURE.

Mètre	= 3.28089 ft.
Decamètre (10 M.)	= 32.8089 ft.
Kilomètre (1000 M.)	= 1093.633 yds
Myriamètre (10,000 M.)	= 6.213 miles
Dècimètre ($\frac{1}{10}$ M.)	= 3.937 inches
Centimètre ($\frac{1}{100}$ M.)	= 0.393 "
Milimètre ($\frac{1}{1000}$ M.)	= 0.039 "

MEASURE OF CAPACITY.

Litre (1 cubic decimètre)	= 1.760 pint
Dècaiitre (10 litres)	= 2.200 gallons
Hectoiitre (100 litres) or	= 22.000 " 2.751 bushels
Kilolitre, mètre cube (1000 litres)	= 3.426 quarters
Dècilitre ($\frac{1}{10}$) of a litre)	= 0.176 pint
Centilitre ($\frac{1}{100}$ of a litre)	= 0.017 "

SUPERFICIAL MEASURE

Are (100 sq. mètres)	= 0.008 rood
Hectare (10,000 sq.mètres)	= 2.471 acres
Centiare (1 sq. mètre)	= 1.196 sq. yd.

WEIGHTS

Gramme (weight of 1 cubic centimètre of water in its state of maximum density, at $39\frac{1}{2}$ Fahr., or 4 degrees Centigrade) = 15.432 grains troy.
Décagramme (10 grammes) = 6 43 dwt.
Héctogram (100 grammes) = 3.527 oz.avoir. or 3.216 oz. troy.
Kilogramme (1000 grammes) = 2.205 lbs. avoir., or 2.680 lbs. troy.
Quintal métrique (100 kilos) = 220.54 lbs.
Millier (1000 kilos.) = 19 cwt. 12 oz. 5 dwt.

Decigram ($\frac{1}{10}$ gram.)	= 1.543 grain
Centigram ($\frac{1}{100}$ gram.)	= 0.15 "
Miligram ($\frac{1}{1000}$ gram.)	= 0.015 "

THERMOMETER

0°Centigrade (melting ice)	=32° Fahrenheit
100° " (boiling water)	=212° "
0° Réaumur (melting ice)	= 32° "
80° " (boiling water)	= 212° "

NOTES ON BELTING.

In the location of shafts that are to be connected with each other by belts, care should be taken to have a proper distance between them. This distance should be such as to allow of a gentle sag to the belt when in motion.

A general rule for this distance is as follows: 15 feet is a good average where narrow belts are to run over small pulleys, the belt having a sag of $1\frac{1}{2}$ to 2 inches.

For larger belts working on larger pulleys, a distance of 20 to 25 feet is proper.

For main belts working on very large pulleys, the distance should be 25 to 30 feet, the belts working well with a sag of 4 or 5 inches.

If too great a distance is attempted, the weight of the belt will produce a very heavy sag, drawing so hard on the shaft as to produce great friction in the bearings, while at the same time the belt will have an unsteady flapping motion which will in a short time destroy both belt and machinery.

Connected shafts should never be placed one directly over the other if possible to avoid it, as in such case the belt must be kept very tight to do the work.

The diameter of pulleys should be as large as possible, provided they do not produce a belt speed exceeding 3000 feet per minute.

Never add to the work of a belt so much as to overload it.

Single belts should be put on so as to run with the grain, or hair side, next to the pulleys, and so the points of the laps will run against the pulleys, as the laps on the outside of a belt are most liable to come apart when the points are run against the atmospheric pressure.

Double belts should be put on so that the points of the laps will run with the pulleys, as both sides point in the same direction.

Useful Rules:

To find the width of belt and diameter of shaft to transmit a stated horse power at a given speed, the following Harpers' short formulae are convenient:

Leather Belts.

Single belting—1″–2″–3″–4″–5″–6″–7″–8″–9″–10″–12″–15″–18″ wide will transmit $\frac{1}{8}$ – $\frac{1}{4}$ – $\frac{3}{8}$ – $\frac{1}{2}$ – $\frac{5}{8}$ – $\frac{3}{4}$ – $\frac{7}{8}$ – 1 – $1\frac{1}{8}$–$1\frac{1}{4}$ – $1\frac{1}{2}$ – $1\frac{7}{8}$ – $2\frac{1}{4}$ H. P. for every 100 feet of velocity per minute. Double belts transmit $1\frac{1}{2}$ times as much as single belts.

Rope Driving.

One rope— $\frac{3}{4}$″–1″–$1\frac{1}{4}$″–$1\frac{1}{2}$″–$1\frac{3}{4}$″–2″ diameter
will transmit $\frac{1}{8}$ –$\frac{1}{4}$ –$\frac{2}{5}$ –$\frac{3}{5}$ –$\frac{4}{5}$ –1 horse power
for every 100 feet of velocity per minute.

Steel Shafting—$1\frac{1}{2}$″–2″–$2\frac{1}{2}$″–3″–$3\frac{1}{2}$″–4″–$4\frac{1}{2}$″–5″–$5\frac{1}{2}$″–6″ diameter will transmit $\frac{1}{2}$ – $1\frac{1}{8}$–$2\frac{1}{4}$ –$3\frac{7}{8}$–6 – 9 –13– 18–24–31 horse power for every ten revolutions per minute.

To ascertain any length of belt required:

Take twice the distance from center to center of shafting and add half the circumference of each pulley.

To determine the length of belt when changing the size of one of the pulleys:

Take the difference between the diameters of the two pulleys, and one-half the difference, and add to length if the change is to a larger pulley, and substract from length if the change is to a smaller pulley.

To determine the length of cross belts:

Square the diameter of the large pulley and the distance between centers; add together and extract the square root.

Square the diameter of the small pulley and the distance between centers; add together and extract the square root.

To the sum of the two roots add one-half the circumference of the two pulleys, and the total will be the required length.

APPROXIMATE POWER CONSUMED BY COTTON MACHINERY.

The Power Required to drive Cotton Machinery varies according to the speed and production of the machines. The following may be taken as a fair average.

Willow	7	H. P.
Bale Breaker	5	"
Single Beater Picker	4	"
Double Beater Picker	8	"
Self-Feeder	1½	"
Roller Card	2 to 3	"
Revolving Flat Card	¾ to 1½	"
Sliver Lap Machine	½	"
Ribbon Lap Machine	1	"
Comber, 8 Heads	½	"
Drawing Frame, per delivery	¼	"
Slubber Fly Frame 48 Spindles per		"
Intermediate Fly Frame 60 " "		"
Fine Fly Frame 90 " "		"
Jack Fly Frame 110 " "		"
Spinning Frame, Medium Gravity Spindle, 8,500 Revolutions 55 " "		"
Spinning Frame, Standard Gravity Spindle, 9,700 Revolutions 65 " "		"
Spooler 200 " "		"
Mule, 9,600 Revolutions 130 " "		"
Quiller 190 " "		"
Twister, Spindle 6,500 Revolutions 40 " "		"
Warper	1/6 to ¼	"
Slasher	1½ to 2	"
Loom	1/8 to ⅓	"
Wide Loom	1	"
Yarn Reel, 50 Spindles	1/6	"
Brusher and Shearer	3	"
Folder	⅛	"
Screw Press	½	"
Engine Lathe	⅕ to ¾	"
Upright Drill	1/6	"