HANDBOOK

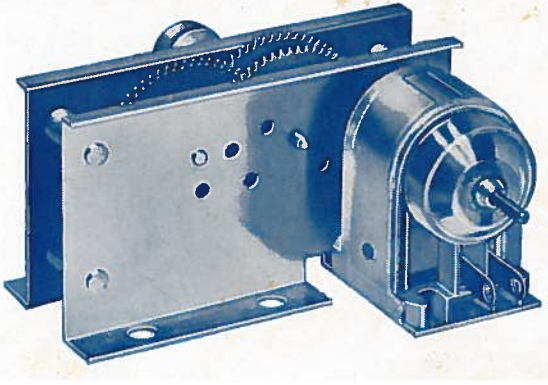
ON

WILSON'S "TINY ATOM" MOTOR

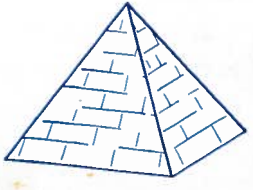
AND

VARIABLE SPEED POWER APPLICATOR

"The World's Smallest Useful Source of Power"



How Gears Can
Multiply Torque



Long before the invention of the steam engine, the electric motor, and the gasoline and diesel engines that perform so many tasks today, men's muscles supplied most of the power to do work. Perhaps the greatest monuments in the world today to the work that man, unaided by modern mechanical contrivances, can perform are the great Pyramids of Egypt. These mighty structures were built by men and levers.

Balanced Lever
Same Length — Same Weights

One of the best examples of lever operation is the see-saw in the playground. Balance the plank and let two boys weighing the same sit on the ends. The plank stays in the same position and moves up and down evenly on both sides. But let a boy weighing 100 pounds sit on one end and a 50-pound boy sit

100 pounds 50 pounds

Same Lengths

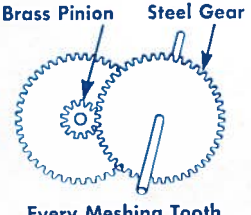
on the other. The loads are no longer balanced. The heavy boy goes down—the light boy goes up—and stays up. Now let's move the plank on the fulcrum so that there is three times as much on one side as the other. Put the heavy boy on the short side and the light boy on the long side. Now the light boy has no difficulty in holding the big boy up because the lever multiplies his weight by 3, and 150 pounds is more than the 100 pounds on the other end.

100 Pounds 1 Unit of Length

50 Pounds 3 Units of Length

Levers don't have to be straight like the plank on the see-saw. Consider "ye olde oaken bucket" that hangs in the well at the end of a rope. Let it fill with water and then try to pull it to the top by hauling in the rope hand over hand. It's a real job, but that's the way people did it for years until someone had a bright idea—the lever. He fastened the upper end of the rope to a round shaft. At the end of the shaft he fastened

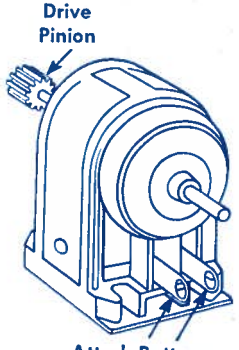
Long Handle
Applies Leverage
to Rotating Shaft

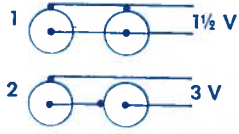


Every Meshing Tooth
of Small Pinion and
Large Gear Exerts
Leverage

a long handle which became a lever. When the handle was turned, the shaft turned and as the rope wrapped around the shaft the bucket was raised quite easily. With a six-inch shaft and an 18-inch handle only one-sixth the muscle power was required to raise the bucket filled with water.

Now let's go a step farther. Gears and pinions, working together, exert leverage—increase torque as speed of rotation is reduced. By using several gears and pinions, even a tiny high speed electric motor that could be stopped easily by a touch of a finger can be made to deliver enough torque to be useful in many ways. That is why we developed the Wilson's "Tiny Atom" Motor and Power Applicator or Gear Train, contained in this box. It will bring you many hours of pleasure and prove highly educational. But first, to get the most out of it, please read the instructions that follow.





Two Batteries Connected
1– in Parallel
2– in Series

A Word About
The "Tiny Atom" Electric Motor

"Tiny Atom" is a high speed direct-current motor that runs at 6000 R.P.M. (Revolutions per Minute) on one or two flashlight batteries or doorbell batteries. The field is an Alnico permanent magnet. The armature is wire-wound on a laminated steel core—the same type of construction that is used on large-size motors. The bearings are brass sleeves. The brushes are phosphor bronze for long life.

It operates on 1½ to 3 volts. Each dry cell is equivalent to 1½ volts. Two in series (negative pole of one connected to positive pole of the other) produce 3 volts. Two in parallel (both negative poles connected and both positive poles connected together) still give only 1½ volts but will run the motor twice as long as one battery. (See drawing lower left.)

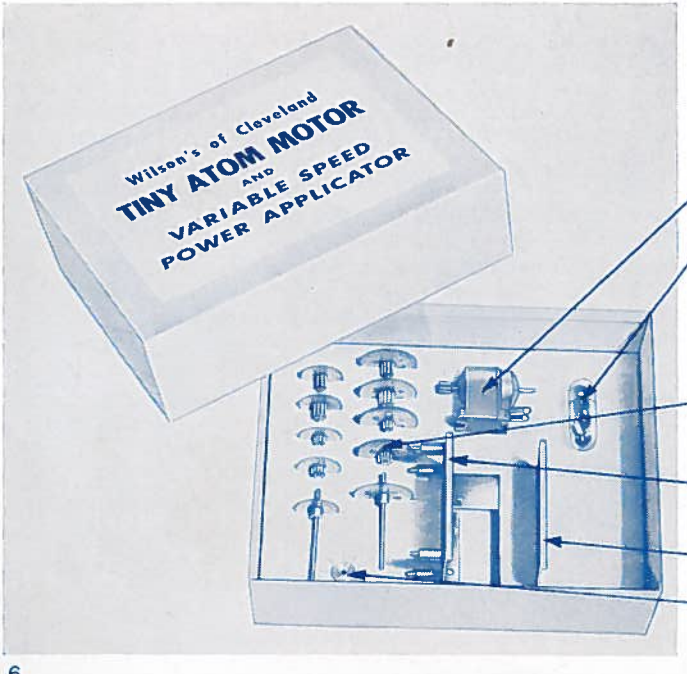
Wires from the battery are connected to the two bronze leads that protrude on one side of the motor frame. This can be done by using small bolts and nuts, but they must not touch one another or the battery will be short circuited. Or, it is better if you can solder the wires to the two leads.

A tiny drop of oil applied with a match stem should be placed on each motor bearing occasionally. Gear bearings may be oiled in the same manner.

The motor shaft is fitted with a pinion which meshes with the gear train gears The illustration on page 8 shows how to mount the motor on the platform of the gear train.

NOTE: Motor Brush Leads should be handled with extreme care.

The Complete



1 - Tiny Atom Motor

2 - Vial Holding Screws, Nuts and Gear Spacers

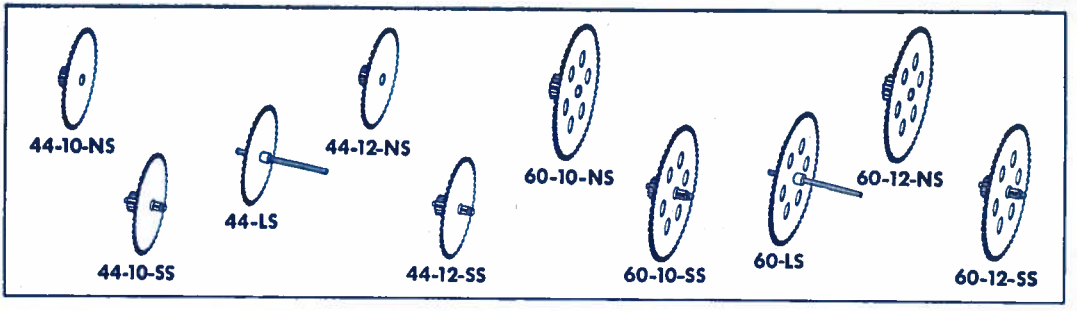
3 - Ten Gears

4 - Side Frame with Motor Support

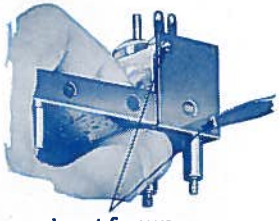
5 - Plain Side Frame

6 - Drive Pulley

Motor and Power Applicator Set Contains:



	SYMBOL
1—60 Tooth Gear with 12 Tooth Pinion and Short Shaft	60-12-SS
1—60 Tooth Gear with 10 Tooth Pinion and Short Shaft	60-10-SS
1—60 Tooth Gear with 12 Tooth Pinion and No Shaft	60-12-NS
1—60 Tooth Gear with 10 Tooth Pinion and No Shaft	60-10-NS
1—60 Tooth Gear with No Pinion and Long Shaft	60-LS
1—44 Tooth Gear with 12 Tooth Pinion and Short Shaft	44-12-SS
1—44 Tooth Gear with 10 Tooth Pinion and Short Shaft	44-10-SS
1—44 Tooth Gear with 12 Tooth Pinion and No Shaft	44-12-NS
1—44 Tooth Gear with 10 Tooth Pinion and No Shaft	44-10-NS
1—44 Tooth Gear with No Pinion and Long Shaft	44-LS



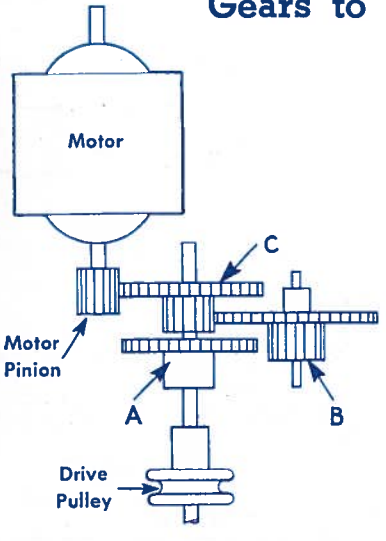
Insert Screws from Under Side

Hold Side Panel in this Position to Insert Gearshafts

Assembly Instructions

1. Hold side frame and motor with left hand with pinion on motor shaft extending through hole in side frame. Insert two screws through bracket into motor base. It is not necessary to turn up screws too tightly.
2. Select the 2 or 3 gears needed from tables on following two pages for the drive pulley speed required and assemble as shown in the sketches at left and on the following pages. The shafts will automatically fall into the correctly positioned holes in the side frame.
3. Holding the assembly in the left hand, place the plain side frame over the tops of the shafts and let it settle over the upper ends of the shafts and the four brass studs at the corners.
4. Turn the four nuts onto the studs and the gear assembly is completed.
5. Slide pulley on drive shaft, tighten the set screw in the pulley, and the unit is ready to use.
6. SPECIAL NOTE—Ten different gears are supplied to make possible the ten combinations required for the 10 speeds listed on the 2 following pages. However, only 2 or 3 gears are required for each speed.

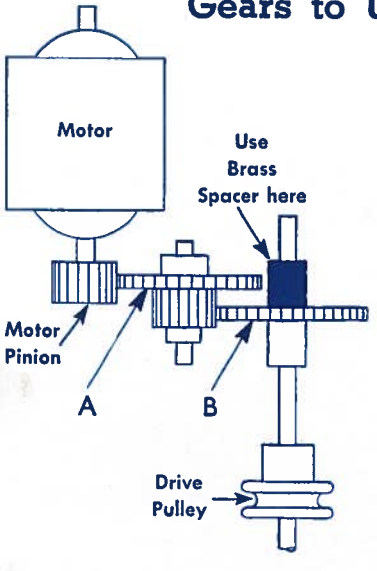
Gears to Use for Slower Drive Shaft Speeds



3 Gears Required

Approx. Speed Rev. Per Min.	Gear SYMBOLS for		
	A	B	C
30	60LS	60-10-SS	60-10-NS
40	60LS	60-12-SS	60-12-NS
60	60LS	60-12-SS	44-12-NS
80	44LS	44-10-SS	44-10-NS
110	44LS	44-12-SS	44-12-NS

Gears to Use for Higher Drive Shaft Speeds

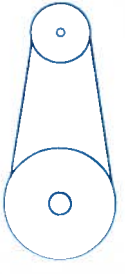


2 Gears and Spacer Required

Approx. Speed Rev. Per Min.	Gear SYMBOLS for	
	A	B
180	60-10-SS	60-LS
220	60-12-SS	60-LS
300	44-12-SS	60-LS
330	44-10-SS	44-LS
400	44-12-SS	44-LS

A Few Typical Applications

Operating on one or two dry batteries, the Wilson's "Tiny Atom" Motor and Power Applicator will deliver enough torque at the drive pulley to operate many models built with Erector and Mechano sets. It will run small flashers, turntables, moving signs, rotating toys, small autos, trucks and locomotives of your own design. It opens the door of your imagination and provides the power needed to operate a host of mechanical gadgets, the scope of which is limited only by your own ingenuity and industry. It will bring you many hours of happiness, and at the same time improve your knowledge of mechanics and power application. Treat it for what it is—a precision built unit—and it will last for a long, long time.



Use a Strong Rubber Band to connect the Drive Pulley to the Driven Pulley

HOW TO ORDER SPARE PARTS

If any part is lost or accidentally broken, a duplicate may be purchased from your dealer. If he does not stock the part, manufacturer will supply it direct, upon receipt of cash when ordered by the Part No. shown below or the SYMBOL in the case of gears.

ALL PARTS FOR VARIABLE SPEED POWER APPLICATOR KIT K-3000

3-100-P	Tiny Atom Motor with permanently attached drive pinion and specially drilled mounting holes 2.50
3-200	Vial contains nuts, set screw and spacer ..... .25
3-300	Side frame with Brass Studs and Motor Bracket ..... .50
3-400	Plain Side Frame ..... .25
3-500 —	Gears .....
44-10-NS	44 Tooth Spur Gear 48 Pitch on 10 Tooth 48 Pitch Pinion with 3/32 center Hole ..... .25
44-12-NS	44 Tooth Spur Gear 48 Pitch on 12 Tooth 48 Pitch Pinion with 3/32 center Hole ..... .25
44-10-SS	44 Tooth Spur Gear 48 Pitch on 10 Tooth 48 Pitch Pinion with Short Shaft ..... .25
44-12-SS	44 Tooth Spur Gear 48 Pitch on 12 Tooth 48 Pitch Pinion with Short Shaft ..... .25
44 LS	44 Tooth Spur Gear 48 Pitch on Brass Hub and Shaft 3/32 x 2" ..... .25
60-10-NS	60 Tooth Spur Gear 48 Pitch on 10 Tooth 48 Pitch Pinion with 3/32 center Hole ..... .25
60-12-NS	60 Tooth Spur Gear 48 Pitch on 12 Tooth 48 Pitch Pinion with 3/32 center Hole ..... .25
60-10-SS	60 Tooth Spur Gear 48 Pitch on 10 Tooth 48 Pitch Pinion with Short Shaft ..... .25
60-12-SS	60 Tooth Spur Gear 48 Pitch on 12 Tooth 48 Pitch Pinion with Short Shaft ..... .25
60 LS	60 Tooth Spur Gear 48 Pitch on Brass Hub and Shaft 3/32 x 2" ..... .25
3-600	Same as K-1285—½" Brass Pulley and Set Screw ..... .35

KIT #1300N
Price $1.00

KIT #3700
Price $3.00

KIT #4000
Price $5.00

ADDITIONAL WILSON'S POWER ACCESSORY KITS

KIT K-1300 CONTAINS

PART NO.		PARTS PRICE LIST
K-1282	Set Screws	6 for .25
K-1283-2	1 Worm Gear 48 Pitch—.208 PD and set screw	.35
K-1284	1 Pulley ¼" OD—.096 Hole ⅜" long—set screw	.25
K-1285	1 Pulley ½" OD—.096 Hole ½" long—set screw	.35
K-1286-1	Pinion Gear—Brass—14 Tooth—48 Pitch set screw	.25
K-1286-3	Pinion Gear—Brass—16 Tooth—48 Pitch set screw	.25
K-1313	Drive Shaft—Plain 3/32 x 2" Steel	6 for .25
K-1290	Flexible Coupling	6 for .25
K-1287	Copper Space Washers	Per Pkg. .25

KIT K-3700 CONTAINS

PART NO.	All of Kit K-1300 and the following parts.	
K-1288-1	½"-24 Tooth Spur Gear, with Hub and set screw	.25
K-1288-2	¾"-36 Tooth Spur Gear, with Hub and set screw	.25
K-1288-3	11/12"-44 Tooth Spur Gear with Hub and set screw	.25
K-1288-4	1¼"-60 Tooth Spur Gear with Hub and set screw	.45
K-1288-5	2¼-108 Tooth Spur Gear with Hub and set screw	.65
K-1288-6	Crown Gear—32 Tooth—with Hub and set screw	.45
K-1291	Pulley Belt	2 for .25
K-1294	Friction Drive Wheel on Hub with set screw	.25
K-1289	Mounting Brackets (4) 7/16 x 1⅜ x 1⅜" with Shaft Holes, Mounting Slots and Mounting Screws	2 for .25
K-1311	Retaining Collar and Set Screws	2 for .25

KIT K-4000 CONTAINS

All of Parts in Kits K-1300, Kit K-3700 plus one No. 3100 Motor and the following parts.

K-1292	Plastic Handle Screw Driver	.25
K-1293	Stranded Wire Cable with Contact Attachments	.25

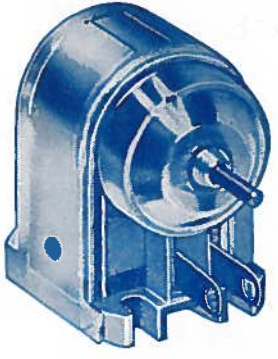
WILSON'S ELECTRIC MOTORS

"TINY ATOM"

Plastic Case—Compact—Powerful—Durable—REVERSIBLE

In Wilson's "Tiny Atom" we believe we offer the ultimate in a fine motor of small size, useful power and great endurance. Every conceivable contingency has been covered to the best of our ability to assure a perfect and practically trouble-free product.

Specifications: Size: 1" x 1⅜" x 1½" high—Shaft Length: 2"—Diameter: 3/32"—Weight: About 2 oz.



NOMINAL TECHNICAL DATA

Voltage D. C.	Load	Speed R. P. M.	Torque In.—Oz.	Current Milliamperes	Horsepower Output
1½	No Load	6,000	0	220	0
1½	Full Load	3,600	.19	750	.0007
3	No Load	10,000	0	250	0
3	Full Load	5,800	.25	850	.0015

Motor is instantly reversible at any speed or load.

AVAILABLE IN 3 TYPES

STOCK NO. 3-100—Tiny Atom Motor with Phosphor Bronze Brushes and Double Extended Shaft.....Price $2.00

STOCK NO. 3-100P—Same as above but with Drive Pinion Attached and extra mounting holes in base.....Price $2.50

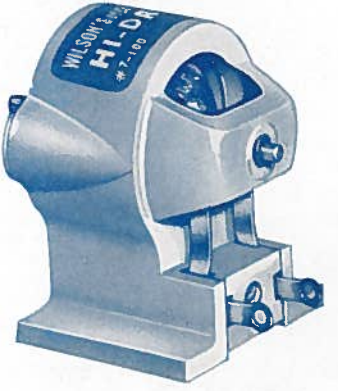
STOCK NO. 6-100—Tiny Atom Motor double extended shaft, Silver Graphite Brush Tips and special windings for 6-Volt operation.....Price $2.50

HI-DRIVE MINIATURE BATTERY-POWERED ELECTRIC MOTORS

FOR BOATS, TRAINS, HOBBY KITS, CARS OR MODEL PLANES

Here is a reliable miniature power source with a multitude of applications for the operation of toys. Hobby enthusiasts have HI-DRIVE-powered trains, planes, trucks, boats, sewing machines, earth movers, model cars, vacuum cleaners, merry-go-rounds, washing machines, helicopters and many other pieces of small equipment. Interesting, educational, practical!

By using gear reduction units, considerable power can be developed at slower speeds, with a surprisingly low battery drain.



THE HI-DRIVE MOTOR In all its variations 1½ to 12 volts

Formerly made by the SPECIALTY BATTERY DIV. OF RAY-O-VAC CO.

Specifications: 1-9/16" high—1-13/32" wide—1-1/8" long—1-21/32" overall length—weight 1.94 ounces.

8-100	3-6 volt, Copper Graphite Brush Tips	$2.50
9-100	6-12 volt, Copper Graphite Brush Tips	$3.00

GUARANTEE

We guarantee all parts to be of finest material and workmanship. Upon delivery, should any defect be apparent, the part will be replaced without charge if mailed to factory with information stating where purchased and purchase date.

GLOSSARY OF TERMS

Torque—"T"=Load x distance of load (at right angles) from center of shaft. Both load & distance are expressed in pounds or ounces and feet or inches. I. E.—"T"= 10 ft.—lbs. or "T" = 20 in.—oz.

Force—"W" Force is the straight line counterpart of torque and is expressed in pounds, ounces, grams, etc.

Work—Work=Force x Distance thru which force is exerted. As applied to torque:
Work=Torque x Circumference of circle thru which torque is applied.

Power—"P"=Rate of doing work or the ability to do a given amount of work in a specified length of time. Power is expressed as horsepower, watts, British Thermal Units (B. T. U.'s) etc.

Horsepower—HP—One horsepower is the power required to lift 33,000 lbs. one foot in one minute.

$$HP = \frac{\text{Load in lbs. x Feet per minute}}{33{,}000}$$

$$HP = \frac{\text{Torque (ft.—lbs.) x R.P.M.}}{5{,}252}$$

Pinion—A small gear which usually serves as a driver for a larger spur gear.

Spur Gear—A common type of gear with teeth on its outer circumference, usually driven by a pinion.

Bevel or Crown gear—A spur gear with its teeth set at an angle to its circumference. Used to change direction of a drive.

Diametral Pitch—D. P. or tooth size number is the number of teeth for each inch of pitch diameter of a gear. All gears and pinions in Wilson's Kits are 48 D. P.

Pitch Diameter—The diameter of a gear measured at its pitch line.

$$\text{Pitch Diam.} = \frac{\text{No. of teeth of gear}}{\text{Diametral Pitch}}$$

$$\text{Ratio—R} = \frac{\text{Speed of motor or input shaft}}{\text{Speed of driven machine or output shaft}}$$

Armature—The rotating part of your "Tiny Atom" motor including the shaft, windings and commutator.

Commutator—A mechanical switch which changes the direction of the electric current thru the armature as it is rotating. The commutator of your "Tiny Atom" motor is the part of the armature upon which the brushes are resting.

Permanent Magnet—A piece of metal which exhibits a permanent attraction for ferrous metals. (Iron, Steel, etc.)

Alnico—A new and very powerful magnetic material containing nickel, iron, cobalt, and aluminum.

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