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Illustrated by : **Nancy Frank**



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- 2 **Building Techniques - Structures**
- 3 **Introduction - Structures**
- 4 **A CELLULAR TELEPHONE**  
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- 5 **Building Card**
- 6 **Ext - Birthday Masks**

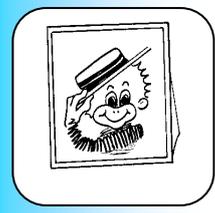


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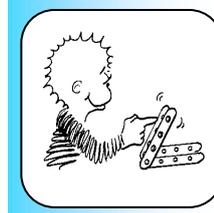
- 24 **Building Techniques - Levers**
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- 26 **A STAMPER**  
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- 7 **PICTURE FRAME**  
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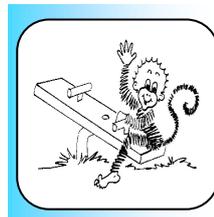
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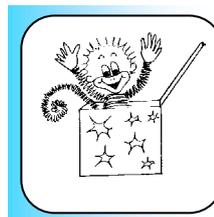
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- 18 **Res - Sailing Boats**
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- 21 **Ext - Paper Boats**
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- 38 **JACK-IN-A-BOX**  
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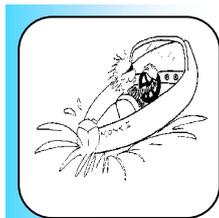


**The only limit to your imagination ... is the power of your mind !**

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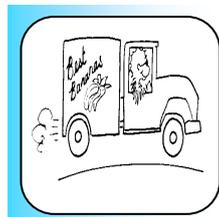
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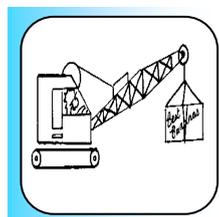
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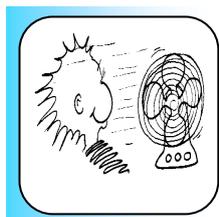


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- 11**
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- 59 **A TURNTABLE**  
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- 62 **A FAN**  
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- 11**
- 63 Building Card



- 64 **ON GUARD**  
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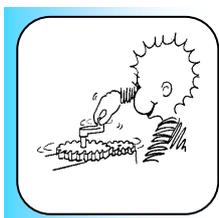
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- 71 Building Card



- 72 **COLOUR CAPERS**  
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- 14**
- 73 Building Card
- 74 Res - Rainbow colours
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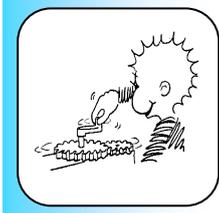
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- 79 **A WHISK**  
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- 15**
- 80 Building Card
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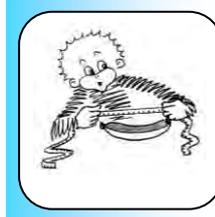
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- 83 Building Techniques - **Crown Gear**
- 84-85 Building Techniques - **Gears**
- 86 **GEARING UP and DOWN**  
*gearing up speed power gearing down*



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- 98 **A MEASURING WHEEL**  
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- 18 Building Card
- 99 Building Card



- 87 **FUN ON THE ICE**  
*spur gear crown gear mesh*
- 16 Res - History of Ice Hockey
- 88 Ext - Helmet
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- 100 **MEASURING MOTOR**  
*cubit fathom span pace foot inch metre cm mm*
- 19 Res - Early measurement units
- 101 Res - Story / Poem
- 102 Ext - Growth Chart
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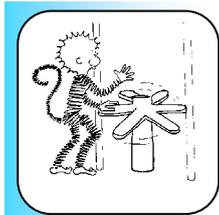
- 90 **A WINCH**  
*crown gear horizontal vertical transfer*
- 91 Building Card



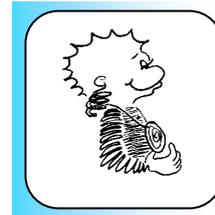
- 104 **PAPER CRIMPING MACHINE**  
*mesh teeth crimp feeder*
- 20 Building Card
- 105 Ext - Crimped Paper
- 106



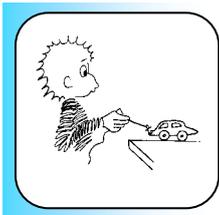
- 92 **A TURNSTILE**  
*input output turnstile*
- 17 Building Card
- 93 Building Card



- 107 **PATTERN MAKER**  
*mesh teeth follower driver idler*
- 20 Building Card
- 108 Ext - Using your patterns
- 109



- 94 Introduction - **Worm Gear**
- 95 Building Techniques - **Worm Gear**
- 96 **CAR with a CRANE**  
*worm gear spiral thread gear housing / box*
- 97 Building Card



- 110 **THE SPINNER**  
*release spin mesh speeding up*
- 21 TG - How the machines work
- 111



## Builder 2



## Extra Materials

Two long plastic spoons per model  
Masking tape, scissors, old plastic milk bottles  
Bowls with water and a little washing-up liquid - two per model

Picture 15



## A WHISK

## CONCEPTS



speeding up big to small gearing up

## LISTEN &amp; DISCUSS

*Bubbles are Fun!*

Read poem/story about bubbles. Who enjoys a bubble bath? Discuss the senses - how it smells, how you feel, how it looks when you are in a bubble bath. We are going to make our own Bubble Maker - a whisk. Discuss Picture 15 - what is the little girl using to create all those bubbles?

## BUILD

*A Whisk*

- ▶ Build the model of the whisk as shown on the following page.
- ▶ Put some water and washing up liquid in a bowl.
- ▶ Put your model to the test - see if you can whisk up the water and washing up liquid to make bubbles.

*Do the beaters turn faster or slower than the speed at which you turned the handle?*

*Were you able to create bubbles in the water?*

*Do all mixers have to turn as fast as possible?*

*What have you made that needs to be whisked at very high speed?*

*If going from big to small is fast, what is the opposite?*

*Where and why would we need this, and is there an advantage to slow?*

- ▶ Try out different types of liquid soap. *Which one makes the most bubbles?*



## DESIGN, MAKE &amp; TEST

Change the design of your model to see if you can:

- \* make the beaters go around five times, for every time the handle goes around once.
- \* improve the beaters and the way they create bubbles - consider the shape of the blades/beaters; consider the speed - which gears are the fastest.
- \* use the spoons and masking tape to make longer beaters.
- \* make a stand for your beater.

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## HANDS ON TECHNOLOGY

### Builder 2



#### Extra Materials

A variety of different coloured paper  
(cut into strips - 3cm wide), foil, plastic,  
tissue paper, glitter, decorations, staplet, glue, scissors

Picture 20



## PAPER CRIMPING MACHINE

GEAR EXTENSION  
EXERCISE 1

### CONCEPTS



### mesh teeth crimp feeder

When two gears join, their teeth mesh together.

### LISTEN & DISCUSS

School Concert

It is school concert time. You have to help to design and make some costumes for the children in the play. You are going to build a machine that will help you to do the job.

### BUILD

A Paper Crimper

- ▶ Build the model of the paper crimper as shown on the next page.
- ▶ Allow the children to try threading various types and lengths of papers through the machine.

*Do all the strips of paper crimp in the same way?*  
*Do all the strips of paper keep their crimped shape?*  
*Are any of the strips of paper too thick to go through the machine?*  
*Do any of the strips of paper tear?*  
*Can you explain how the paper becomes crimped?*

- ▶ Try moving the handle to the bottom axle and then feed a paper through the machine.  
*Is it easier or harder to operate the machine with the handle in the lower position? Can you say why?*



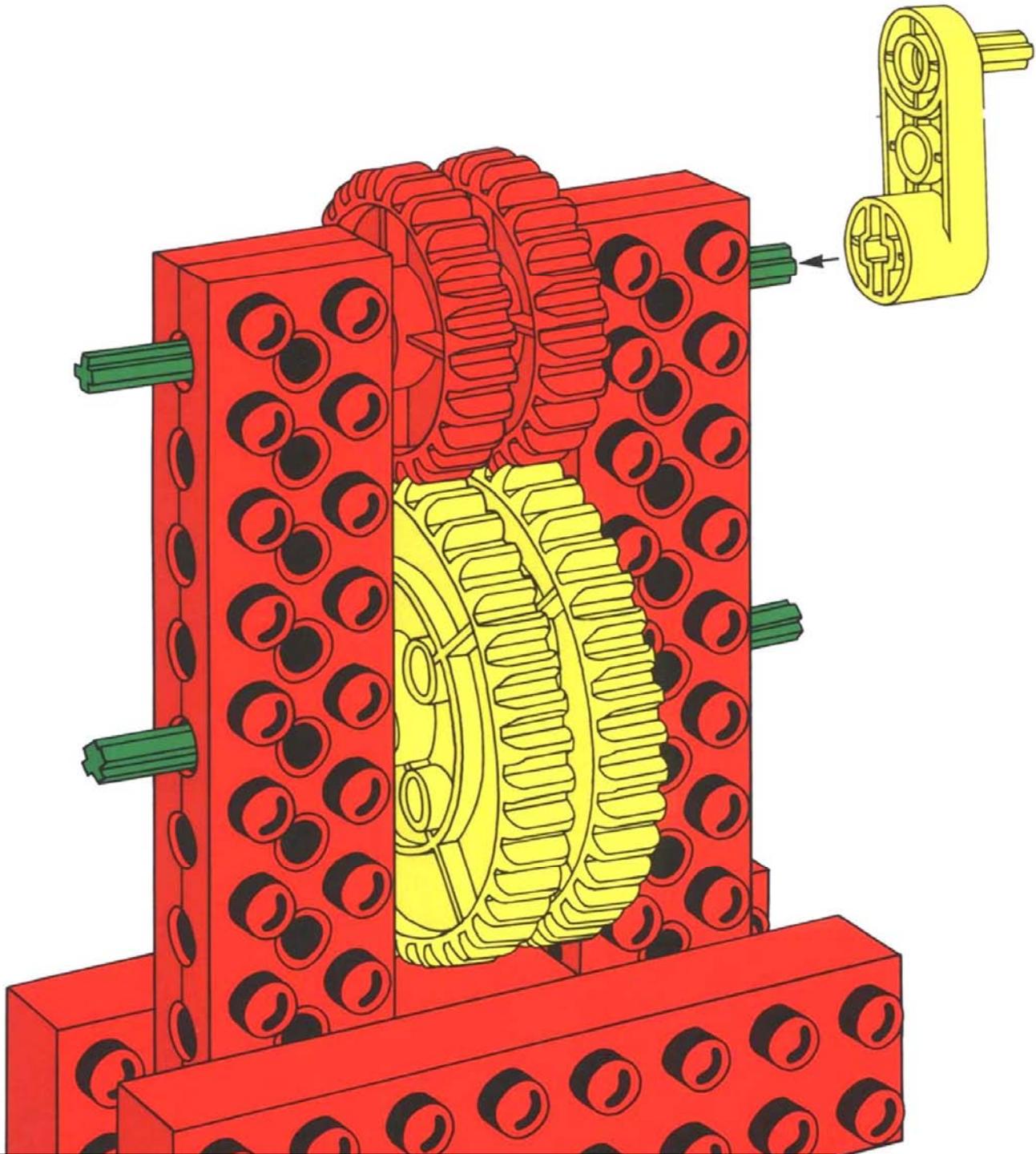
### DESIGN, MAKE & TEST

Use your machine to make as many strips of different lengths as you can. Create:

- \* a wig - measure the size of your head and make a frame or a supporting structure. Attach the crimped "hair".
- \* a crown or a helmet for the king/queen - attach crimped "hair".
- \* jewellery and a skirt for the queen; a belt for the king - try weaving or joining your crimped paper.

See ideas on page 106.

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**PAPER CRIMPING MACHINE****Builder 2**

Use more than one set to see if you can build a larger crimping machine - one that can crimp larger sheets of paper.

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# HANDS ON TECHNOLOGY

## Builder 2



### Extra Materials

*A variety of different coloured paper - cut into strips  
Stapler, glue, scissors, paper, glitter, decorations  
Paints, kokis, crayons*



### Use your crimped paper - Extension



You can make:

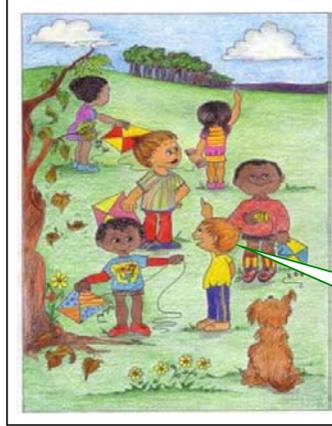
- decorations
- wigs
- mobiles
- belts
- jewellery
- paper chains
- masks
- helmets
- crowns
- ribbons and bows
- paper dolls
- handbags



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**Builder 2****DESIGN, MAKE & TEST****Materials***additional Duplo bricks**various sizes of plastic cups**hair dryer*  
*material scraps***THE PROBLEM**

The children have new kites and are excited to fly them. It looks like a great day outside, but is the wind strong enough? You need to design a machine that will be able to tell how windy it is.

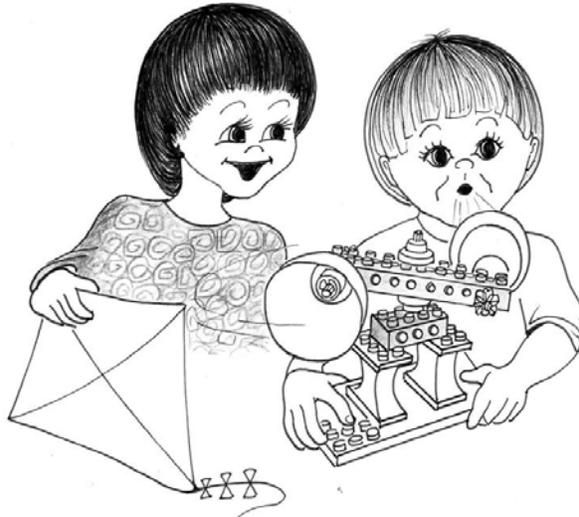


Is the wind strong enough to fly our kites?

**DESIGN, MAKE & TEST**■ **A Wind-Speed Indicator****Design Criteria**

Your design should:

- \* be able to rotate freely in the wind.
- \* indicate how strong the wind is.
- \* be safe to use.
- \* not topple over if the wind is very strong.



Two Little Sisters  
Two little sisters went  
walking one day,  
Partly for exercise, partly  
for play  
They took with them  
kites which they wanted  
to fly,  
One a great centipede, one  
a great butterfly.  
Then up in a moment the  
kites floated high,  
Like dragons that seemed  
to be touching the sky!  
A Chinese Nursery  
Rhyme

**Questions**

Is the axle well supported?  
Can your wind speed indicator  
rotate freely?

Does the model indicate how strong the wind is?  
Is the base designed in such a way as to  
withstand the force of the wind?

Test your model by using a hair dryer to create the effect of the wind. You need to find the most effective way of catching the wind. Try out different sizes and shapes of cups and see which works the best.

**Further Extension**

- ✦ Discuss real life devices that indicate wind speed and direction - a windsock, a windmill, flags, a washing line. Try building one of these using the Duplo set.

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