

## THE NOISE INSTRUMENTS OF LUIGI RUSSOLO

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The publication of Luigi Russolo's futurist manifesto, *The Art of Noises*, in March of 1913 marked the beginning of one of the strangest and most colorful musical careers of this century. Up to that time, Russolo's endeavors had been strictly limited to the graphic arts. Although he had studied the violin and organ with his father, an amateur church organist, and although his older brothers, Giovanni and Antonio, were graduates of the Milan conservatory, Russolo had remained essentially a novice in musical matters. Even his career in the visual arts had been spotty: he had been variously employed from time to time as a designer of theatrical costumes, a restorer of Renaissance paintings, and a free-lance engraver.

In 1910, however, his professional activities had taken a more definite direction when he had joined with the Milanese artists Umberto Boccioni and Carlo Carrà in forming a painters' branch of the futurist literary movement created only the year before by the Italian poet, F. T. Marinetti. Russolo was the most enthusiastic, if not necessarily the most gifted, of the new group. The new freedom of choice and technique offered by the wild and woolly doctrines of futurism seem to have greatly spurred his imagination. Some of his paintings of the period, with their superimposed and freely-associated images, clearly look ahead to the surrealism of painters like Chagal.

It is curious, then, that Russolo should have chosen this moment to launch a totally new career. The change in direction

can be explained, if it can be explained at all, only by the force of his new idea. In *The Art of Noises* Russolo had found a new vision, one that lured him into an incredible foreshadowing of music to come. Musician or not, he would pursue it. The last sentence of the manifesto is charged with the defiant conviction of a man with a cause: “Bolder than a professional musician could be, not bothered by my apparent incompetence, and convinced that audacity has all rights and all possibilities, I have been able to devine the great renewal of music through *The Art of Noises*.”<sup>1</sup>

This conviction would last for the next twenty years. It would carry Russolo through the First World War and the turbulent cultural events of the 1920's. It would take him into the concert halls of London and Paris. He and his strange instruments would meet—and impress—some of the greatest musicians of his day, Stravinsky, Ravel, Honegger and Varèse among them. Only later, after the collapse of his dream of manufacturing and marketing his instruments world-wide, would he turn away from his vision to lead the life of a wandering mystic. Penniless now, he would eke out a scant meal a day through palm readings and seances, claiming to effect miraculous cures by his powers as a magnetist.

In his manifesto, Russolo had presented a new musical esthetic, an esthetic so audacious for its time that his contemporaries (including even Igor Stravinsky) considered him merely an amusing eccentric. Yet, his thesis was logical enough. If music is sound, why must these sounds be limited in their variety of timbre? Why not use sounds like those made by people and animals, the sounds of nature, the sounds of a modern industrial society? Thus, Russolo projected a music that would be com-

pounded of the innumerable sounds of human existence, “. . . the muttering of motors that breathe and pulse with an undeniable animality, the throbbing of valves, the bustle of pistons, the shrieks of power saws, the starting of a streetcar on the tracks, the cracking of whips, the flapping of awnings and flags.”<sup>2</sup>

Russolo’s idea had found its source in the doctrines of Marinetti, whose *Manifesto of Futurism* had erupted from the front page of *Le Figaro* only a few years earlier. The manifesto had proclaimed a total revision of esthetic values. Cries like “Burn the museums!” and “Flood the libraries!” bristle from its pages.

In his own words, Marinetti had “championed . . . a lyricism that was rapid, brutal, and immediate, a lyricism that must have appeared antipoetic to all of our predecessors, a telegraphic lyricism that had none of the taste of books, and as much as possible the taste of life.”<sup>3</sup> His favorite themes were modernity and technology. But while these themes had been used by others before him, Marinetti was unique in evolving a poetic technique that was especially suited to these subjects. The new poetical technique, called *free words* (*parole in libertà*), was conceived during his activities as a correspondent in the Libyan War. It was essentially an attempt to liberate the sounds of poetry from the restrictions of grammar and syntax. His primary tool for achieving this end was the onomatopoeia—the freely-invented onomatopoeia. The noises of machine guns, bombs, and shrapnel became new words in a complex poetical vocabulary. A breathless use of language injected new rhythms and variety into the aural elements of poetry. Set in a poetical context that used verbs only in the infinitive, that discarded most of the conventions of syntax, that required nouns to fill the role of ad-

jectives, even Marinetti's earliest efforts in the new idiom managed to portray vividly the turmoil, speed, and confusion of modern warfare.

Marinetti, then, had already conceived and put into practice the idea of "noise as poetry." There can be no doubt that his idea helped to shape that of Russolo. For Marinetti, the realization of the idea had been the evolution of a new poetic language. For Russolo, it was the creation of a new model for musical sound—and the construction of an entire orchestra of incredible instruments to embody that model.

Thus, probably even before the publication of his manifesto, Russolo abruptly abandoned the graphic arts and turned his studio into a workshop. Together with another Milanese painter, Ugo Piatti, he toiled literally night and day to create mechanical instruments that could realize the music of noises envisioned by the manifesto. Only a few weeks after the appearance of the manifesto, the first of the new instruments was ready for a public demonstration at Modena. The instrument, a *burster* (*scoppiatore*) as Russolo named it, produced a noise similar to that of an early automobile engine. The noise could be produced throughout the pitch range of "ten whole-tones," including all intermediate microtones. The new instrument was greeted with a mixture of serious consideration and raucous derision. Other instruments followed quickly: a *hummer* (which sounded like an electric motor), a *rubber* (with a metallic scraping sound), and a *crackler* (somewhat like a cross between a mandolin and a machine gun).

Barely two months later, an audience invited to Marinetti's home in Milan could hear an orchestra of sixteen such instruments in a performance of two compositions written by Russolo

himself, *Awakening of a City*, and *The Meeting of Automobiles and Airplanes*.

Guests at the event included a number of press representatives, among them an anonymous correspondent of the London *Pall Mall Gazette*, who later published an account of the gathering. His description of Russolo's first composition, *Awakening of a City*, provides a glimpse of the strong impression that this concert must have made upon its listeners:

At first a quiet even murmur was heard. The great city was asleep. Now and again some giant hidden in one of those queer boxes snored portentously; and a new-born child cried. Then, the murmur was heard again, a faint noise like breakers on the shore. Presently, a far-away noise grew rapidly into a mighty roar. I fancied it must have been the roar of the huge printing machines of the newspapers.

I was right, as a few seconds later hundreds of vans and motor lorries seemed to be hurrying towards the station, summoned by the shrill whistling of the locomotives. Later, the trains were heard, speeding boisterously away; then, a flood of water seemed to wash the town, children crying and girls laughing under the refreshing shower.

A multitude of doors was next heard to open and shut with a bang, and a procession of receding footsteps intimated that the great army of bread-winners was going to work. Finally, all the noises of the street and factory merged into a gigantic roar, and the music ceased.

I awoke as though from a dream and applauded.<sup>4</sup>

This first, private concert was seemingly the only occasion on which Russolo allowed his listeners to view the interior of the

instruments. According to the reporter, the instruments contained “drum skins, wooden disks, brass plates or bagpipes, all set into motion by hand spikes.”

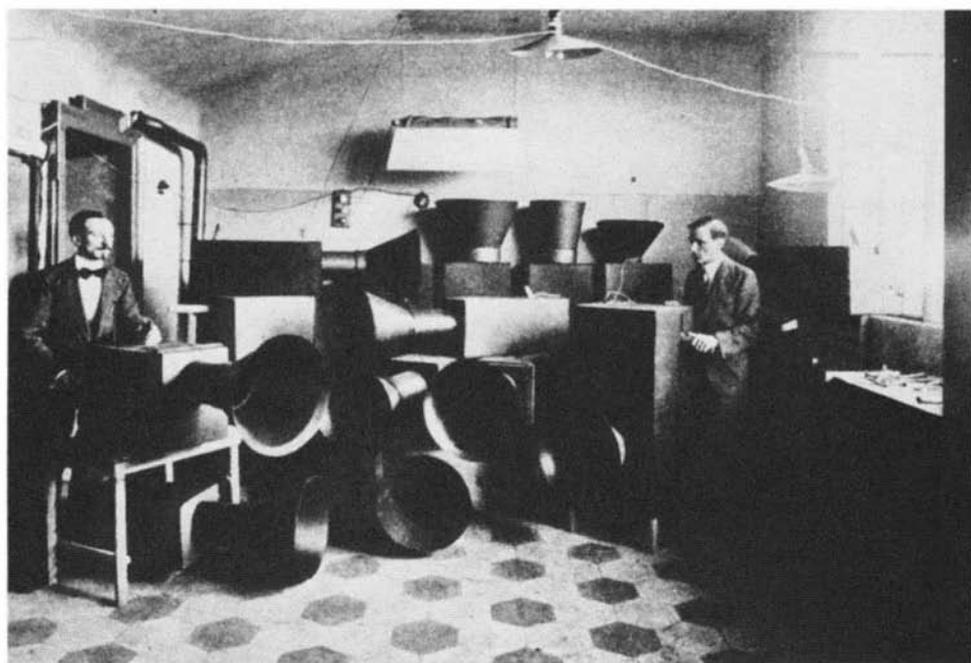
Another clue to the nature of this composition is found in two pages of the score that were later published in the Florentine literary magazine *Lacerba*. (The rest of the score, as well as all of Russolo’s other scores have vanished.) These two pages display the constant use of drones and glissandos. Although the individual entrances of the instruments and the presence of contrary motion in the parts give the impression of polyphony, the music has a clearly harmonic intent. The first of the two pages seems to be loosely based on a chord intervallically constructed like a dominant seventh with the root of G.

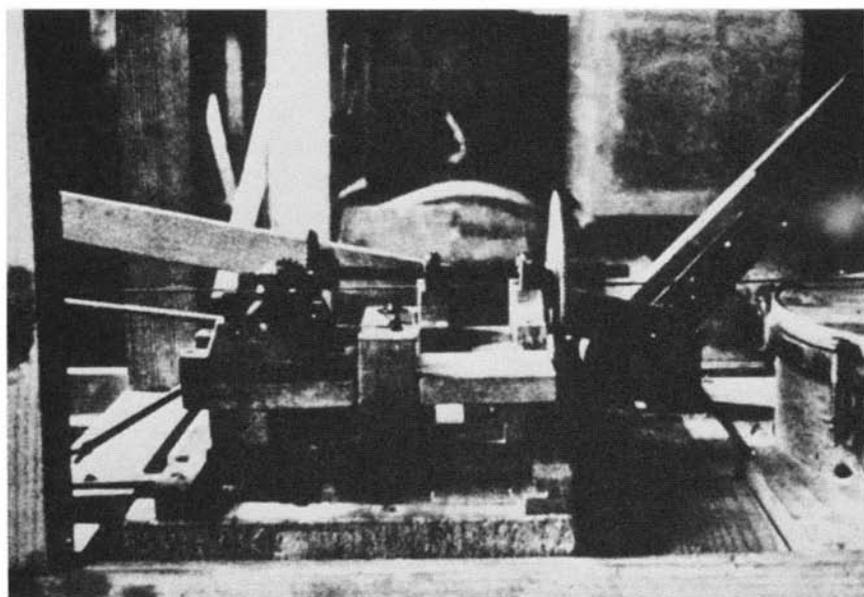
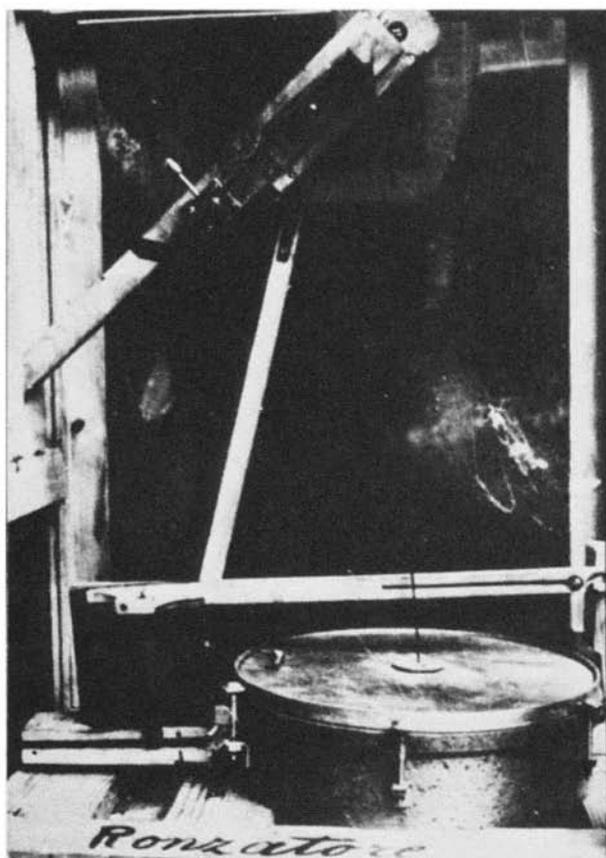
Unfortunately, none of this can recreate the actual sound of the music. Not one of Russolo’s instruments—and he built many more than the original sixteen—has survived. Some are known to have been destroyed during the Second World War; the rest have simply disappeared. Russolo’s own descriptions of the sounds they produced are largely based on analogy, so that his reader is required to make a mental composite of several different qualities. Even the one surviving phonograph recording of the instruments playing together with a conventional orchestra, made in 1921, fails to give more than a tenuous idea of the sound of the instruments. The two short pieces contained on the recording, pieces written by Russolo’s brother Antonio, both use the instruments *en masse*, thus obscuring their individual sounds. The primitive technology of the recording leaves even their collective sound in doubt.

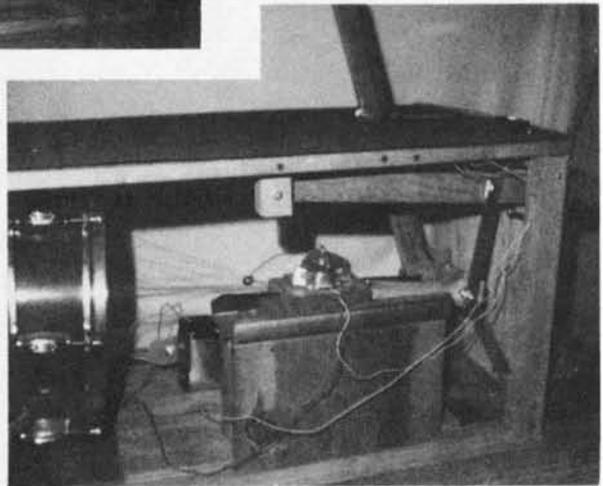
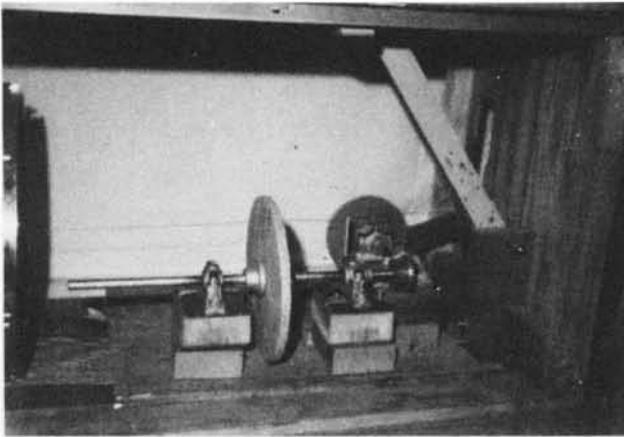
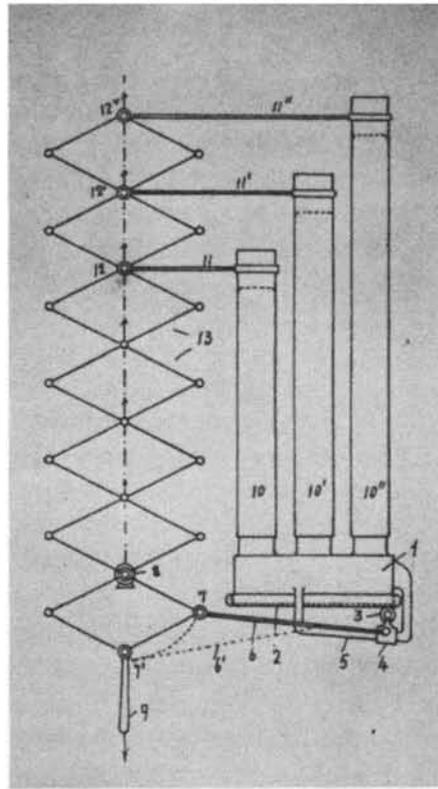
Barring the discovery of actual specimens of the instruments, a prospect that seems extremely unlikely, the only hope of

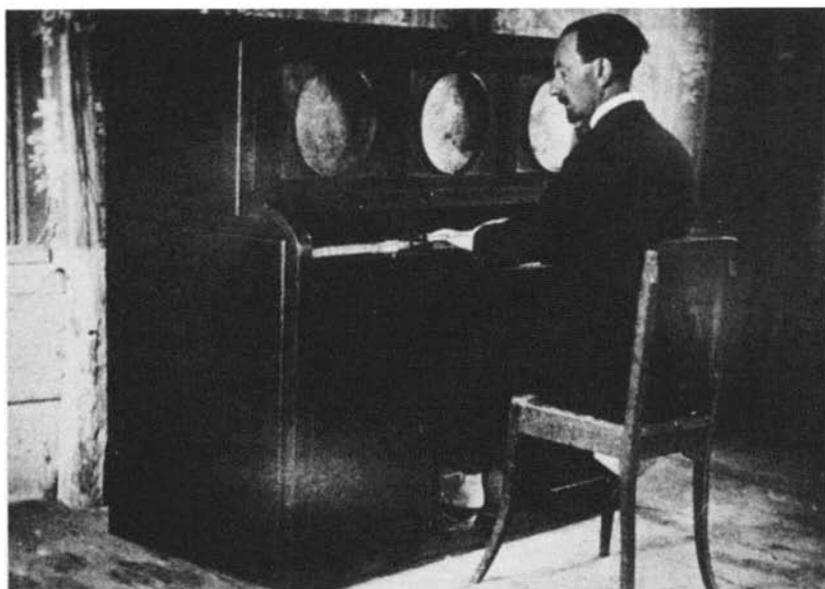
recapturing their sounds is through reconstructing the instruments on the same principles that they were originally built. Russolo, looking forward to the possibility of marketing them, was reluctant to reveal the details of their construction. Nevertheless, from his own early descriptions, from several patents that he later made, and from a slight legacy of notes and photographs, it is possible to piece together not only his general methods but in a number of cases also the details of the instruments.

Physically, the noise instruments were boxes of various colors and sizes, each with an impressive horn protruding from its front. In describing the interior of the instruments, the nameless correspondent of the *Pall Mall Gazette* several times mentions the inclusion of “drums and drumskins.” The inclusion is significant. In an article published in *Lacerba* at the beginning of July 1913, Russolo defined the importance of these drums. “. . . A single taut diaphragm,” he wrote, “through the variation of its









tension produces a scale of ten whole-tones, with all the intermediate semitones, quarter-tones, and smaller fractions of a tone. The preparation of the material for this diaphragm, in special chemical baths, varies according to the timbre of the noise desired. By varying the means of exciting the diaphragm, other noises can be obtained, with the same possibilities of varying the pitch.”<sup>5</sup>

Russolo’s diaphragm, whatever its nature, was stretched upon an ordinary drum frame (a detail known from photographs of the interior of the instruments). The usual method of varying the

tension was by pulling on a wire connected to its center. This pitch-defining mechanism, in other words, was a refined version of the washtub bass.

By various means of exciting either the wire or the drumskin itself, Russolo was able to produce a great variety of noises. The *hummer* (or *ronzatore*), one of the instruments whose mechanism is known from a photograph, vibrated a metal ball against the drumskin through the action of a small electric motor. Although the motor is not visible in the photograph, the mechanism was more complex than might be expected, since the photograph shows an additional mechanism to move the ball back from the skin as the tension increased, thus allowing the ball to continue to vibrate freely.

A second photograph shows a mechanism that excited the wire attached to the skin rather than the skin itself. Shallow grooves have been filed into the rotary blade that turns against the wire. A system of gears and shafts transmits the motion generated by turning a hand spike to the blade. In the background is the lever that tightens the skin. The photograph is not labeled; but when the instrument was reconstructed by copying the details of the photo, it produced a sound that matched fairly closely the one that Russolo describes for the *rubber*, or *strop-piciatore*.

In at least one of the instruments, the *whistler* or *sibilatore*, the vibration was apparently transmitted to the skin by means of the air pressure within an air-tight drum. A patent made by Russolo in 1921 may have represented a simplified version of this instrument. Russolo specifies that the telescoping organ pipes were tuned to the tones of a major triad. As the pipes were telescoped a metal roller automatically changed the tension of the skin. The windchest of the instrument may have been the

“bagpipes” observed by our correspondent.

Although Russolo avoided any description of the noise-generating mechanisms of his creations, he left rather detailed descriptions of the noises that they produced. In all, the instruments generated twelve distinctive noises, and for the most part, each of these noises was produced by three different sizes of the instrument: large, medium, and small. Here is a complete list of the twelve types:

1. The howler: a noise somewhere between that of a traditional string instrument and that of a siren
2. The roarer: a rumbling noise in the low-pitched instruments
3. The crackler: a metallic crackling noise in the high-pitched instruments; a strident metallic clashing in the low ones
4. The rubber: a metallic scraping sound
5. The hummer: a noise resembling the sound of an electric motor
6. The gurgler: a noise like that of water running through the rain gutters of a house
7. The hisser: a hissing or roaring noise like that produced by heavy rain
8. The whistler: a noise like the whistling or howling of the wind
9. The burster (1): a noise like that of an early automobile engine
10. The burster (2): a noise like the falling and shattering of dishes or pottery
11. The croaker: a noise like the croaking of frogs
12. The rustler: a noise resembling the rustling of leaves or of silk.

Some of these instruments, like the hummer, the rubber, and the whistler, have ready-made descriptions. For others, such as the howler, the crackler, and the roarer, the details of construction may be gathered from various comments made by Russolo. The mechanisms of still others may be guessed at from scattered observations of contemporaries. A few remain entirely problematical.

It seems likely that the first four instruments of the twelve, the howler, the crackler, the roarer, and the rubber, formed a group that shared a common means of sound production. In all of these, a wooden or metal disk turned against the wire attached to the center of the drumskin. Russolo stated in an unpublished article<sup>6</sup> that the roarer and the crackler shared a common principle of sound production with the enharmonic bow. The enharmonic bow, known from a patent, was a metal rod with periodic grooves or indentations that was drawn across strings of a conventional string instrument to produce a new timbre. The photograph of the rubber actually shows a metal disk with such indentations. The correspondent of the *Pall Mall Gazette* specifically mentions "brass plates." Russolo himself groups together the howler and the roarer, the crackler and the rubber, as pairs of instruments identical in range, which may well indicate a similarity of construction.<sup>7</sup>

Experiments in reconstructing the instruments show that a wooden disk with an even but roughened rim, turning against the wire that connects with the drumskin, produces a sound much like that which Russolo describes for the howler. A wooden disk with indentations produces a noise similarly matched to the description of the roarer. A metal disk with teeth like those of a ratchet makes a noise like that of the crackler. A metal disk with shallow indentations produces a sound like the rubber.

Efforts have been made to reconstruct three of the instruments that fall in this group: the howler, the crackler, and the rubber. Russolo has left two descriptions of the noise made by each of these instruments, one in a book published in 1916,<sup>8</sup> the other in a letter written to Balilla Pratella in 1921.<sup>9</sup>

According to Russolo the howler was the most musical of the noise instruments. Its howling was almost human in character, though it recalled the siren to some extent. It lent itself especially well to legato passages, rather like the glissando of the violin. It was doleful, velvety, and soft, a mysterious and suggestive instrument.

The instrument was played, like the majority of the noise instruments, by turning a crank with the right hand. The crank set into motion a wooden disk that turned against the wire leading to the drumskin. The left hand moved a lever that regulated the tension of the wire. Attached to this lever was a pointer that could indicate on a written scale the pitch that the instrument was producing. Some of these details can be seen in the photograph of the reconstruction. The pitch range of the reconstructed instrument is smaller than that described by Russolo—less than a tenth, in fact. The reduced range is probably attributable to the material of the drumskin. Like all of Russolo's instruments, it can be tuned. In addition, the position of the wooden disk in relation to the wire can be adjusted.

The crackler Russolo described as a little like the mandolin. It produced a metallic crackling, unlike the sound of any other musical instrument. It was as loud as a trumpet, although it could produce single tones of a tinkling delicacy.

In the crackler, the noise is produced by turning against the wire a metal disk with teeth rather like those of a ratchet. Russolo's disk must have had fewer teeth than the one used in

the reconstructed instrument, since it is fairly difficult to produce single tones (one tooth at a time) on the present instrument. In this regard, it must be said that none of the reconstructed instruments necessarily sounds exactly like the instruments of Russolo. There are too many variables involved: the number of teeth, the thickness and composition of the wire, the placement of the bridge (which influences the overtones), the nature of the drumskin. In terms of mathematical probability, it is unlikely that they are exact duplicates of Russolo's instruments. But they are undoubtedly similar in character, since they are constructed on the same principles.

Another reconstruction is the gurgler, or *gorgoliatore*, one of the most colorful of the noise instruments. The gurgler produced a sound like that of rain running through the gutters of a house. According to Russolo, the instrument produced a curiously rhythmic metallic sound. Also, by depressing a stop a second noise, like the hissing roar of heavy rain, could be added to the first. This stop was another of Russolo's twelve basic timbres. It was called the hisser, or *scrosciatore*.

The sound of the gurgler is created by a metal ball on a spring-like wire. The ball is caused to vibrate against the wire leading to the drumskin. From time to time the ball rebounds from the wire with different degrees of force, thus creating the curious rhythm mentioned by Russolo. Depressing a lever brings a number of spring-like wires to rest lightly on the drumskin itself. The wires are made to vibrate by the same motor as the gurgler. Therefore, this mechanism, which produces the noise of the hisser, cannot be made to sound independently of the gurgler. The single, battery-powered motor is activated by a button on top of the instrument. The gurgler does not produce the sound

of running water but of water running through a rain gutter (the difference is considerable). The hisser, on the other hand, is remarkably similar to the sound of heavy rain. As Russolo commented, despite its apparent weakness of sound the instrument is very clearly audible.

Toward the end of 1921, Russolo began planning the construction of an instrument that could produce the noises of a number of his previous instruments. The planning and construction of the first of these instruments required several years. The instrument was completed only in the spring of 1924. The *noise harmonium*, as he called it, had three short keyboards with keys like those of the piano. The openings for the three drums that the keyboards controlled are evident in the photograph. In the summer of 1924 he constructed another such instrument; and in November of the same year he presented a demonstration of the two instruments at the First National Futurist Congress in Milan in a lecture entitled "Unification of the Noise Instruments in the Noise Harmoniums (5 Keyboards, 8 Timbres)."

In 1927 he finished the construction of a single noise harmonium that produced all twelve basic noises. This instrument, as he related in an article published in *Melos*,<sup>10</sup> abandoned the use of keys to return to the pitch-control levers of the original instruments. Still another version of the instrument was produced in 1928. This last version was eventually lodged at Studio 28 in Paris, where it frequently accompanied silent movies. It was through this instrument that the legend of Russolo lingered on into the 1930's.

Although none of the reconstructed instruments are exactly reproductions of those of Russolo, they may serve to give some idea of the character of his instruments, and perhaps bring a

touch of reality to a colorful legend. In some respects Russolo was far ahead of his time. He was probably not only the inventor of the first mechanical synthesizer but the first major exponent of musical synthesis itself. He seems to have been the first individual of this century to set before himself the deliberate and exclusive goal of creating a new music from artificially generated sounds. If he failed to obtain the personal recognition that he so greatly deserved, his efforts were not without result. His real vindication lies in the course of musical thought in this century, especially in the past several decades. He was unfortunately a spirit too far ahead of his time.

#### NOTES

1. Luigi Russolo, "L'Arte Dei Rumori, Manifesto Futurista" (Milan, 1913), p. 4.
2. Russolo, Op. cit., p. 2.
3. Quoted from Russolo, *L'Arte Dei Rumori* (Milan, 1916), p. 53 f.
4. *Pall Mall Gazette* (London), Nov. 18, 1913.
5. Russolo, "Gl'intonarumori futuristi," *Lacerba* (July 1, 1913), p. 140.
6. "L'archet enharmonique," now in possession of Russolo's nephew, Bruno Boccato at Sesto Calende in Lombardy.
7. Russolo, *L'Arte Dei Rumori*, p. 77
8. *L'Arte Dei Rumori*.
9. The letter, dated August 19, 1921, is now in the possession of Dr. Ala Pratella.
10. *Melos* (VII/I) January 1928, pp. 12-14.