SUPERIOR COURT OF THE STATE OF CALIFORNIA

COUNTY OF SAN FRANCISCO

DEWAYNE JOHNSON,

Plaintiff,

vs. Case No. CGC-16-550128

MONSANTO COMPANY, et al.,

Defendants.

_____/

Proceedings held on Friday, July 27, 2018, Volume 18, Morning Session, before the Honorable Suzanne R. Bolanos, at 9:11 a.m.

REPORTED BY:

LESLIE ROCKWOOD ROSAS, RPR, CSR 3462

Job No. 2965334A

Pages 3812 - 3943

APPEARANCES:

FOR THE PLAINTIFF:

R. BRENT WISNER, ESQ.
BAUM, HEDLUND, ARISTEI, GOLDMAN PC
12100 Wilshire Boulevard, Suite 950
Los Angeles, California 90025
310-207-3233

DAVID DICKENS, ESQ.
JEFFREY TRAVERS, ESQ.
THE MILLER FIRM, LLC
108 Railroad Avenue
Orange, Virginia 22960
540-672-4224

FOR THE DEFENDANT:

SANDRA A. EDWARDS, ESQ.
FARELLA BRAUN + MARTEL LLP
235 Montgomery Street
San Francisco, California 94104
415-954-4400

APPEARANCES (Continued):

FOR THE DEFENDANT:

GEORGE C. LOMBARDI, ESQ.
JAMES M. HILMERT, ESQ.
WINSTON & STRAWN LLP
35 West Wacker Drive
Chicago, Illinois 60601
312-558-5969

KIRBY T. GRIFFIS, ESQ.
HOLLINGSWORTH LLP
1350 I Street, N.W.
Washington, D.C. 20005
202-898-5800

INDEX OF PROCEEDINGS

WITNESS	DIRECT	CROSS	REDIRECT	RECROSS
CHARLES BENBROOK	3853			

EXHIBITS ADMITTED

(None.)

Friday, July 27, 2018

9:11 a.m.

Volume 18

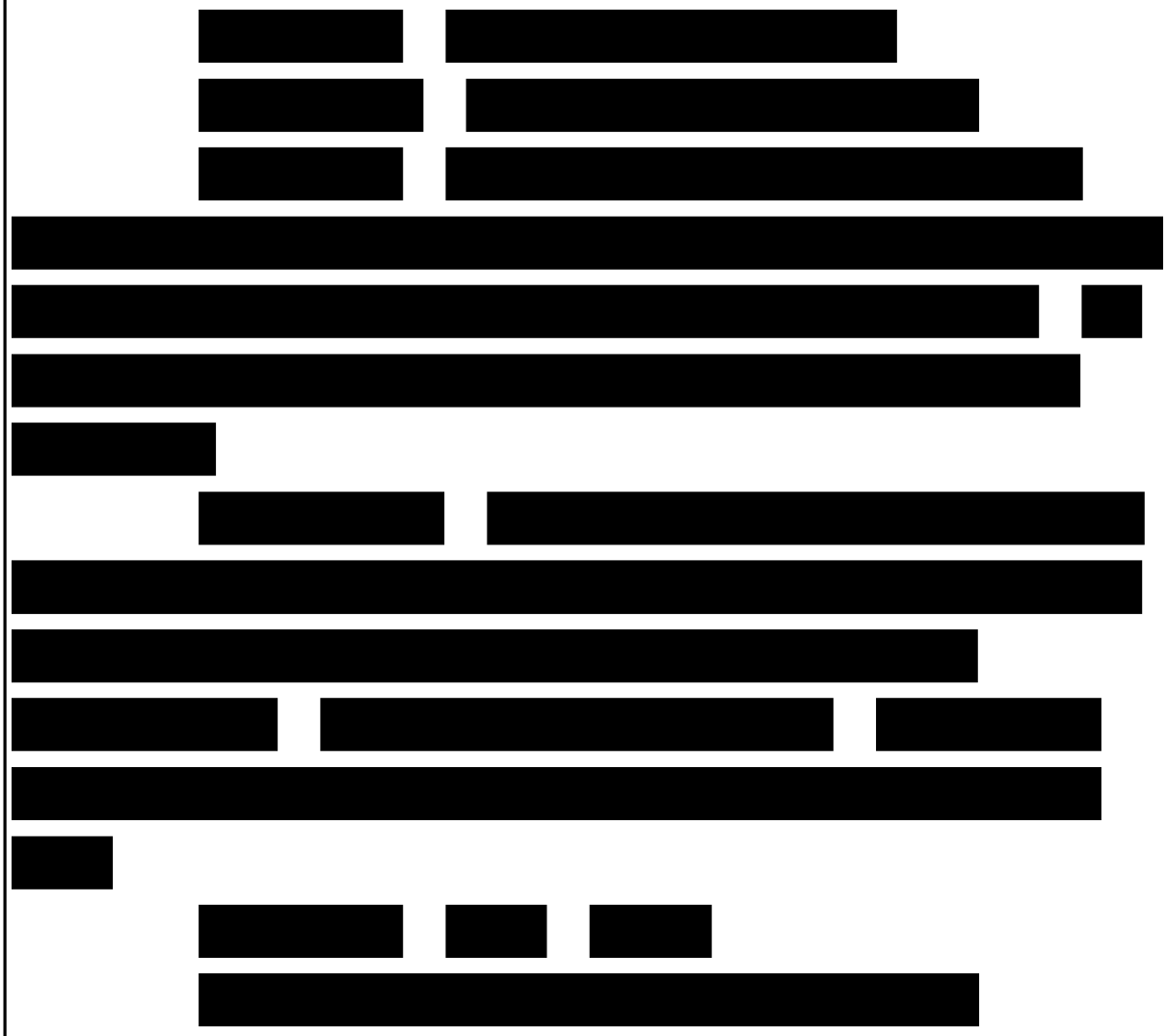
Morning Session

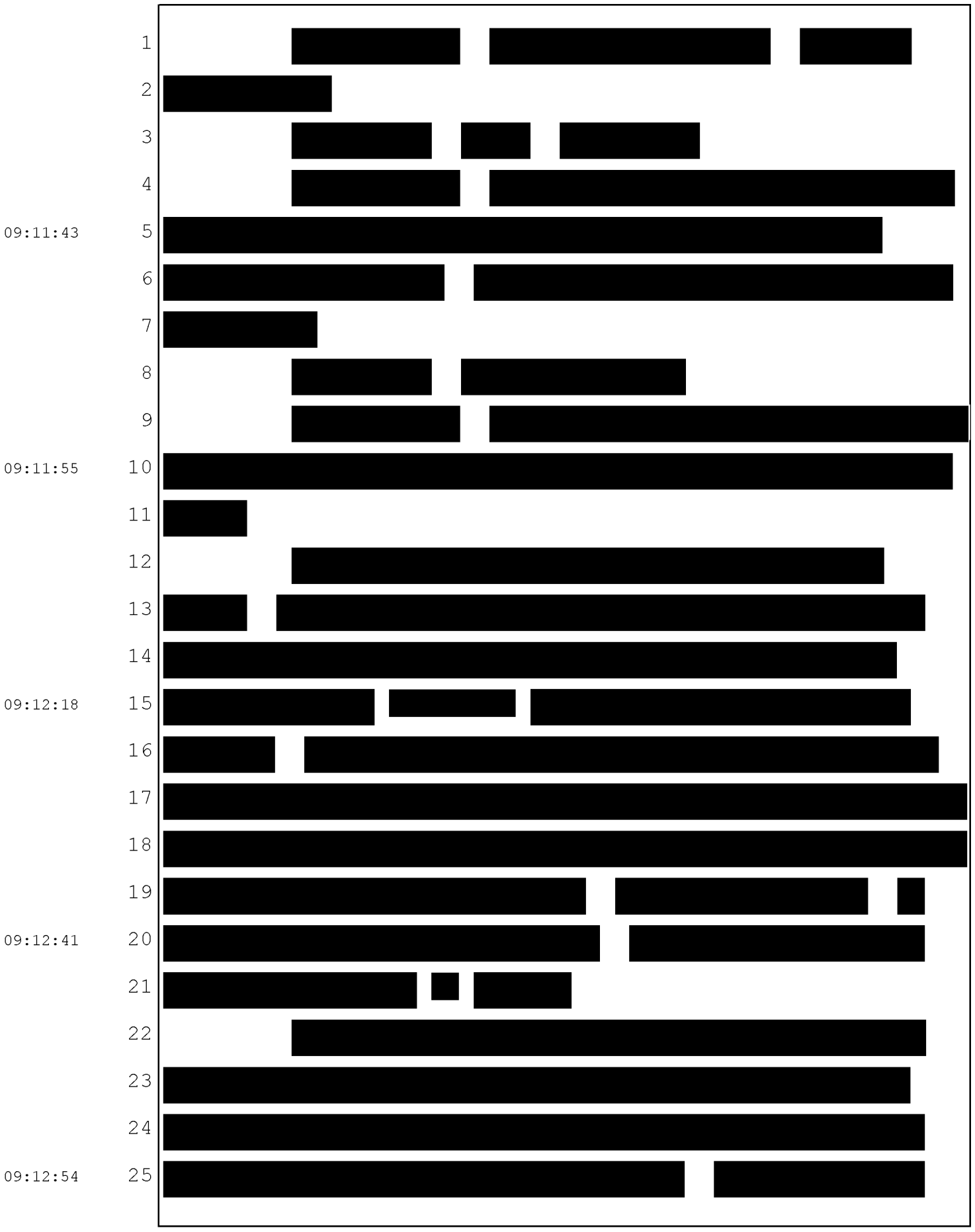
San Francisco, California

Department 504

Judge Suzanne Ramos Bolanos

PROCEEDINGS

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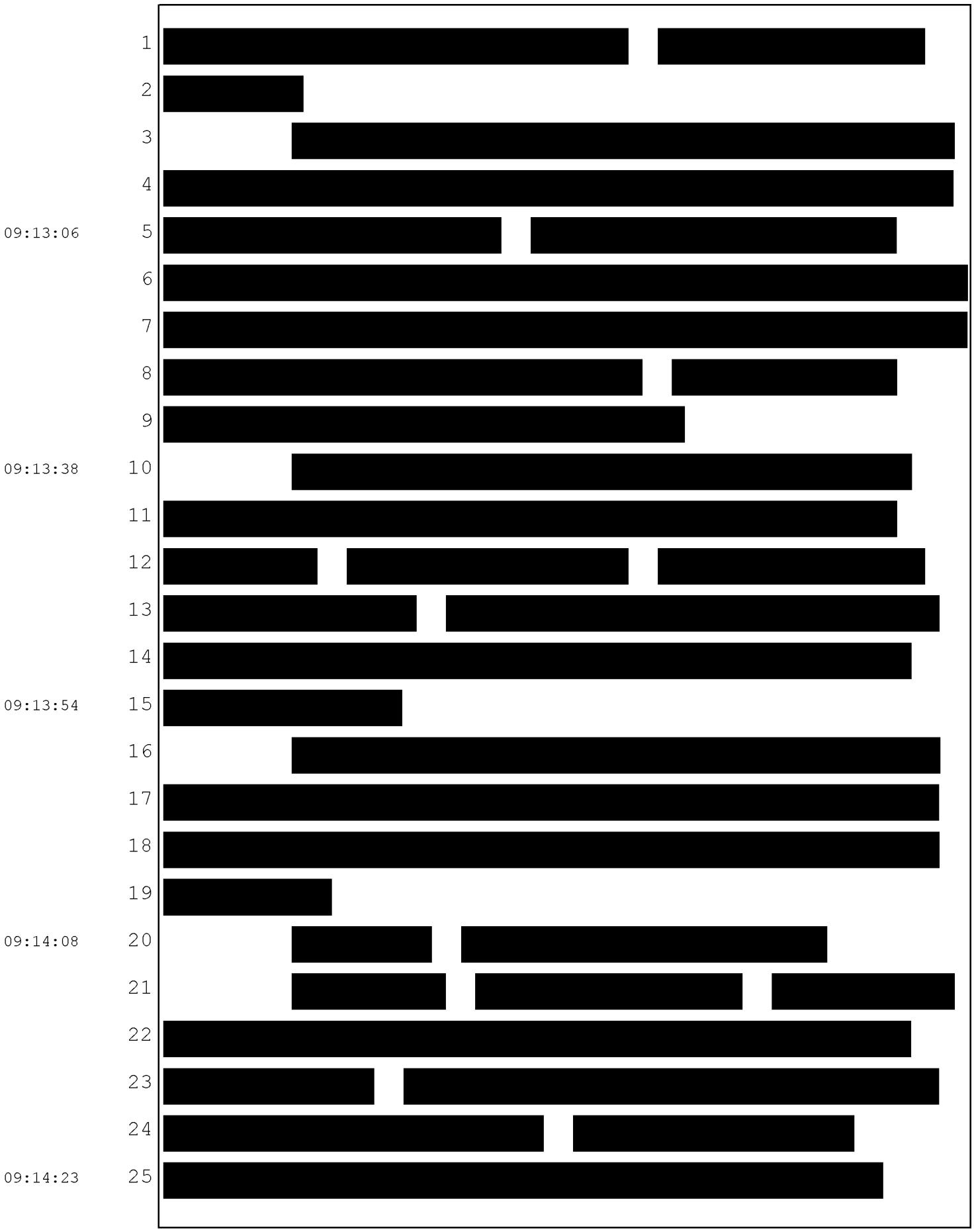
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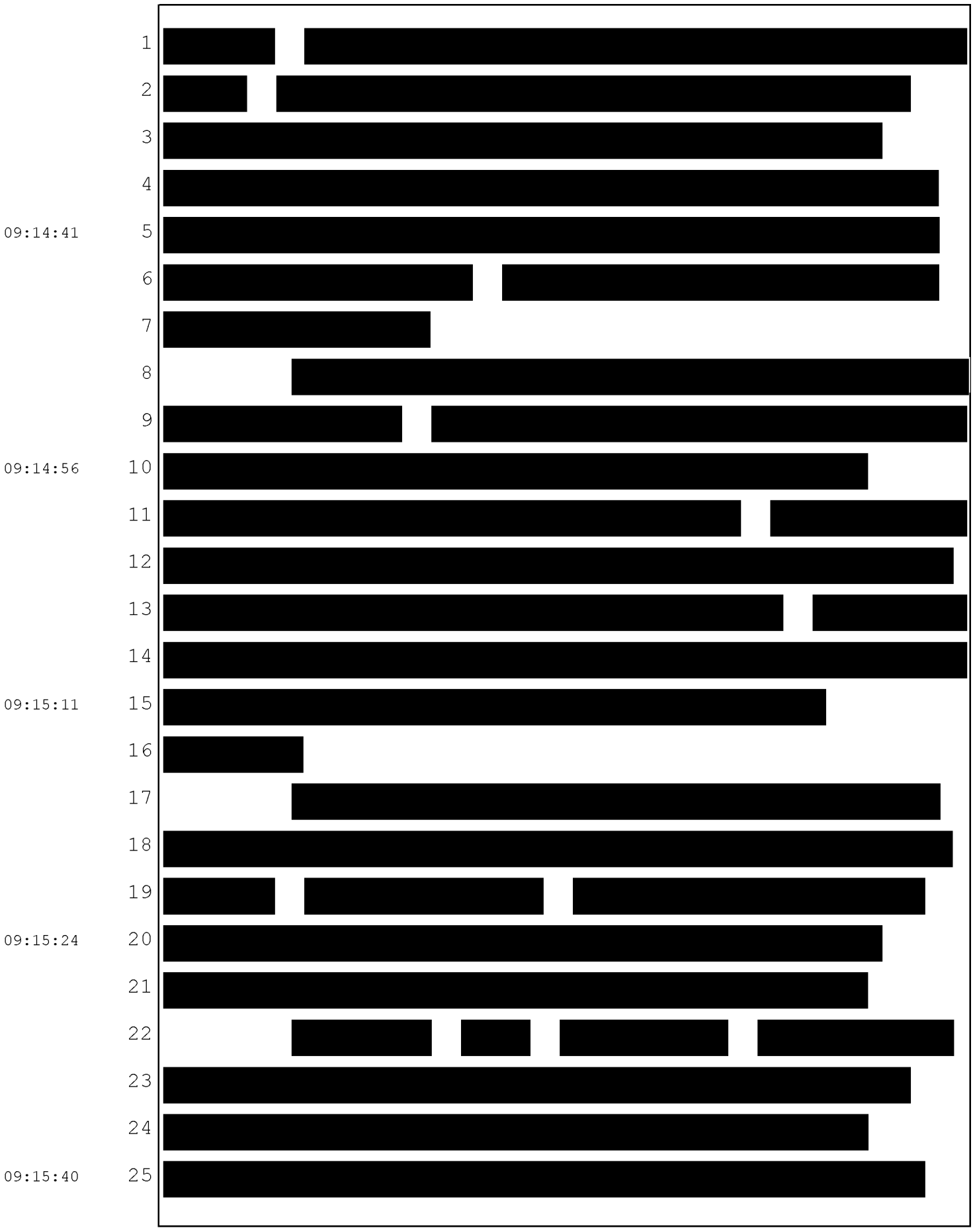
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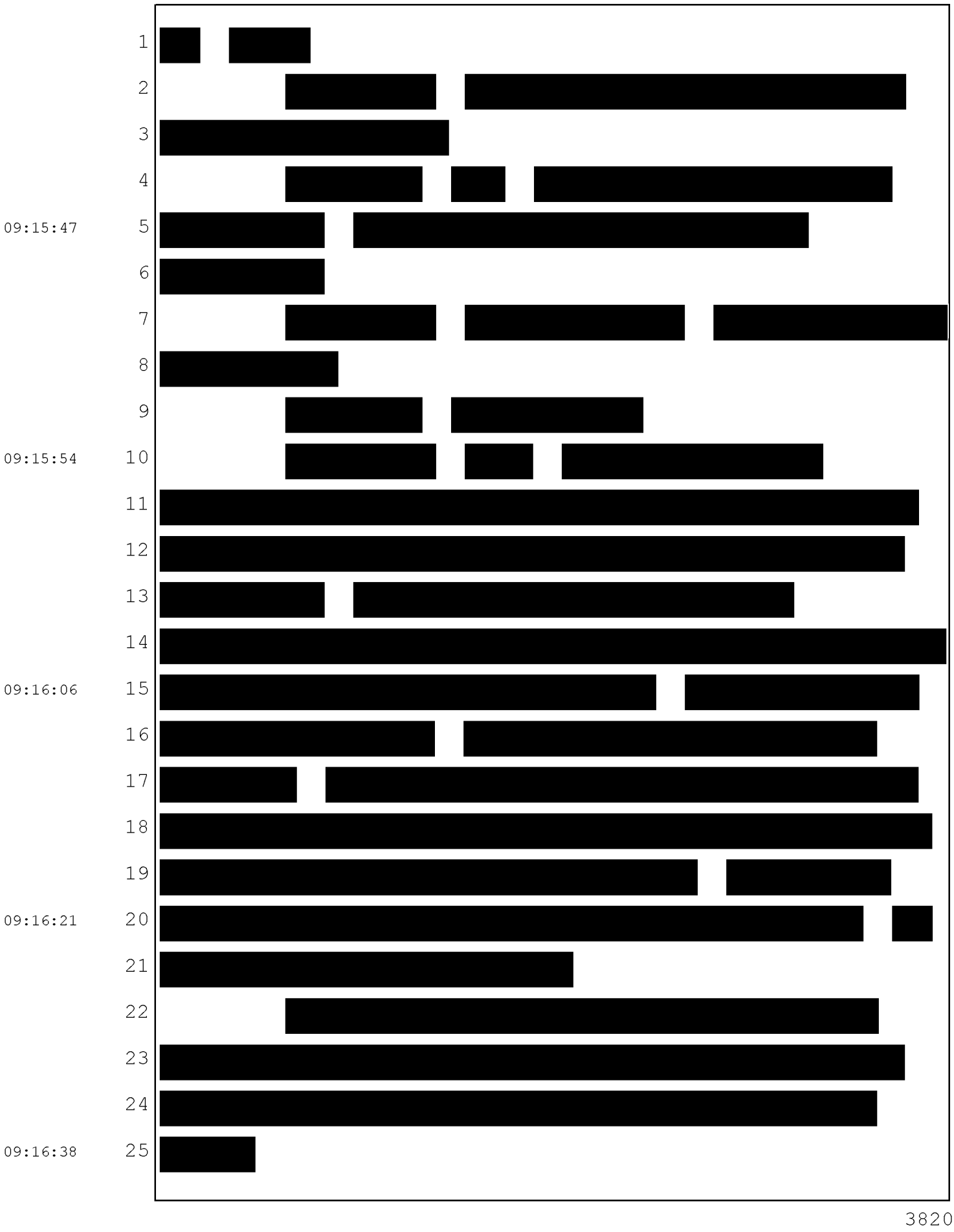
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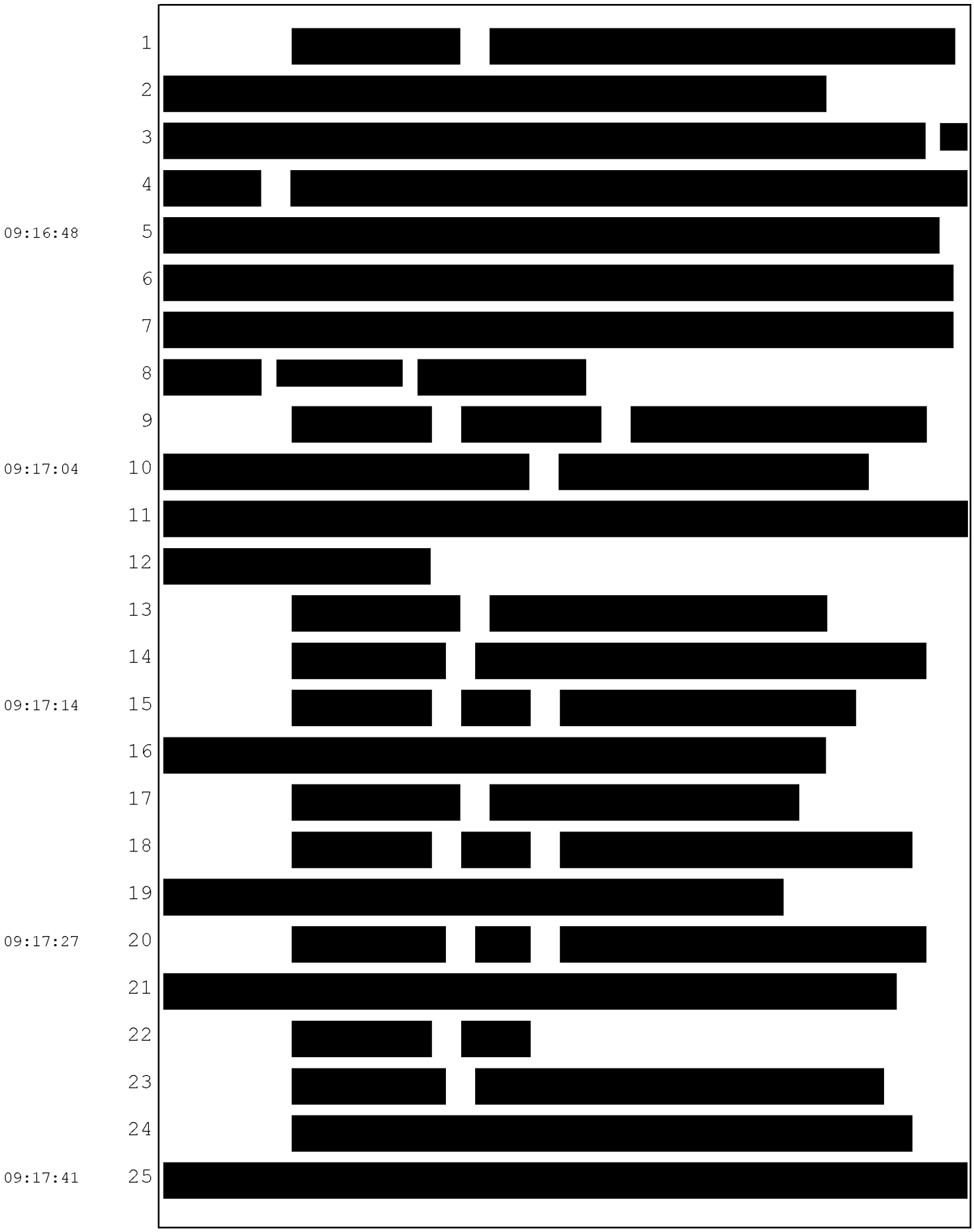
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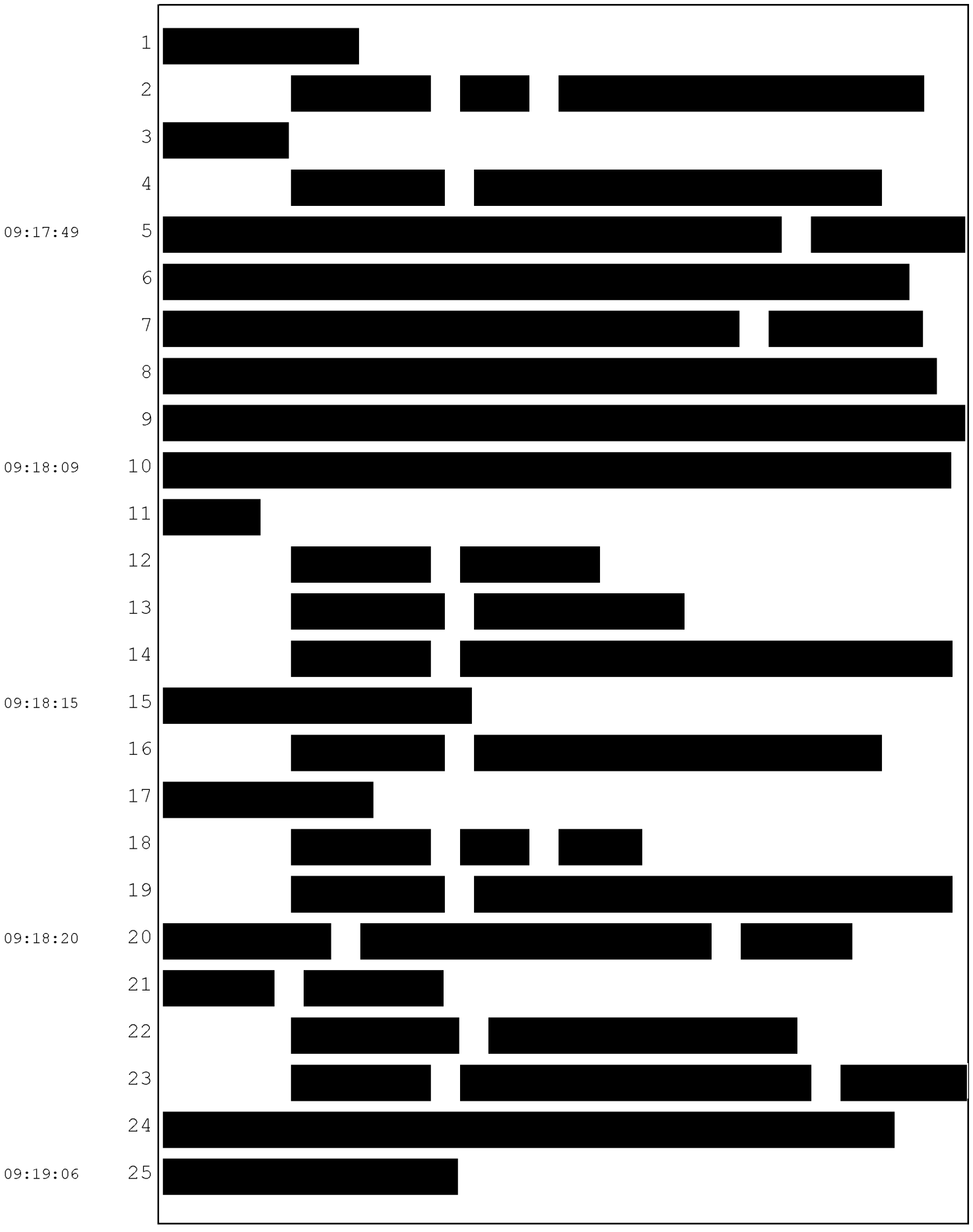
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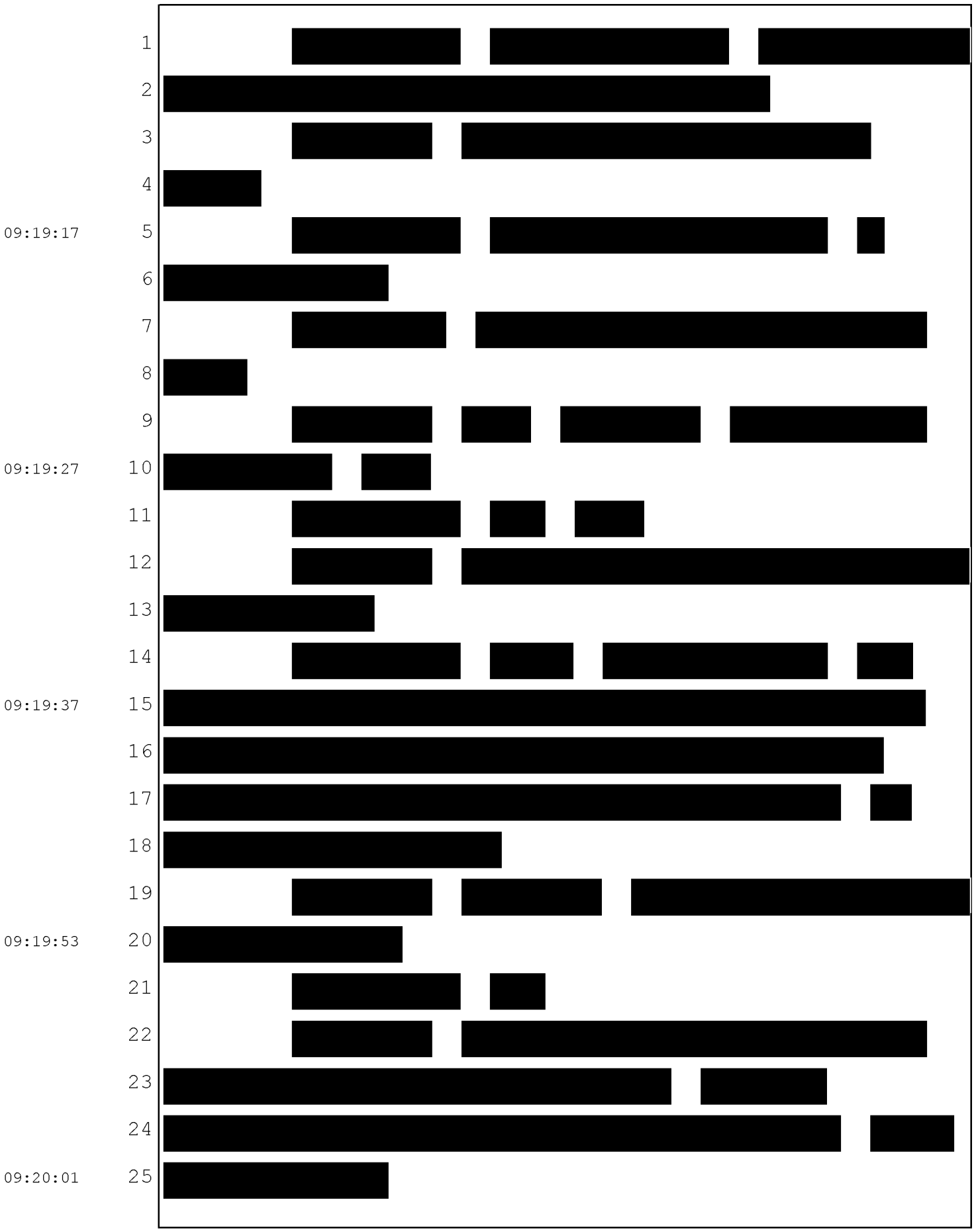
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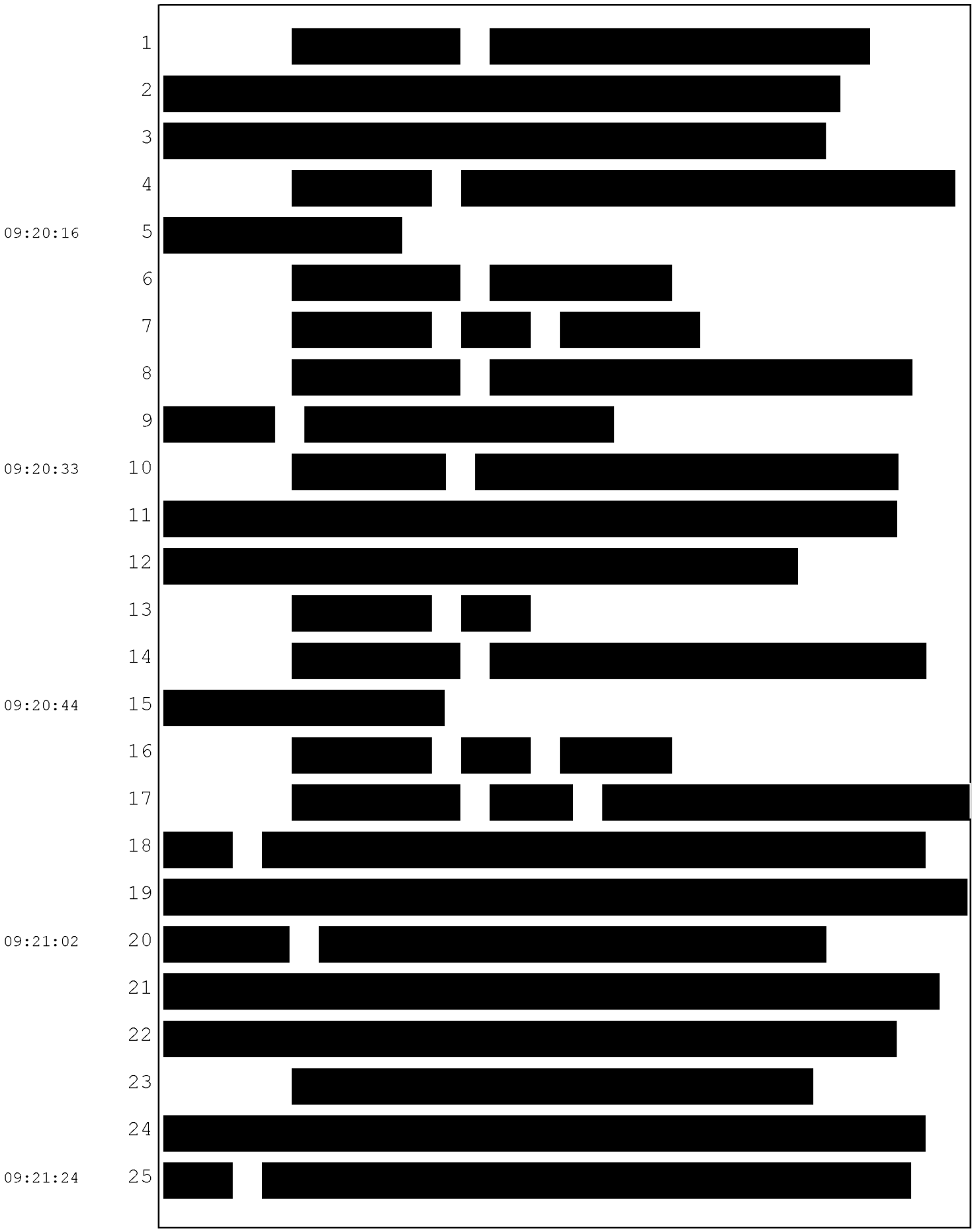
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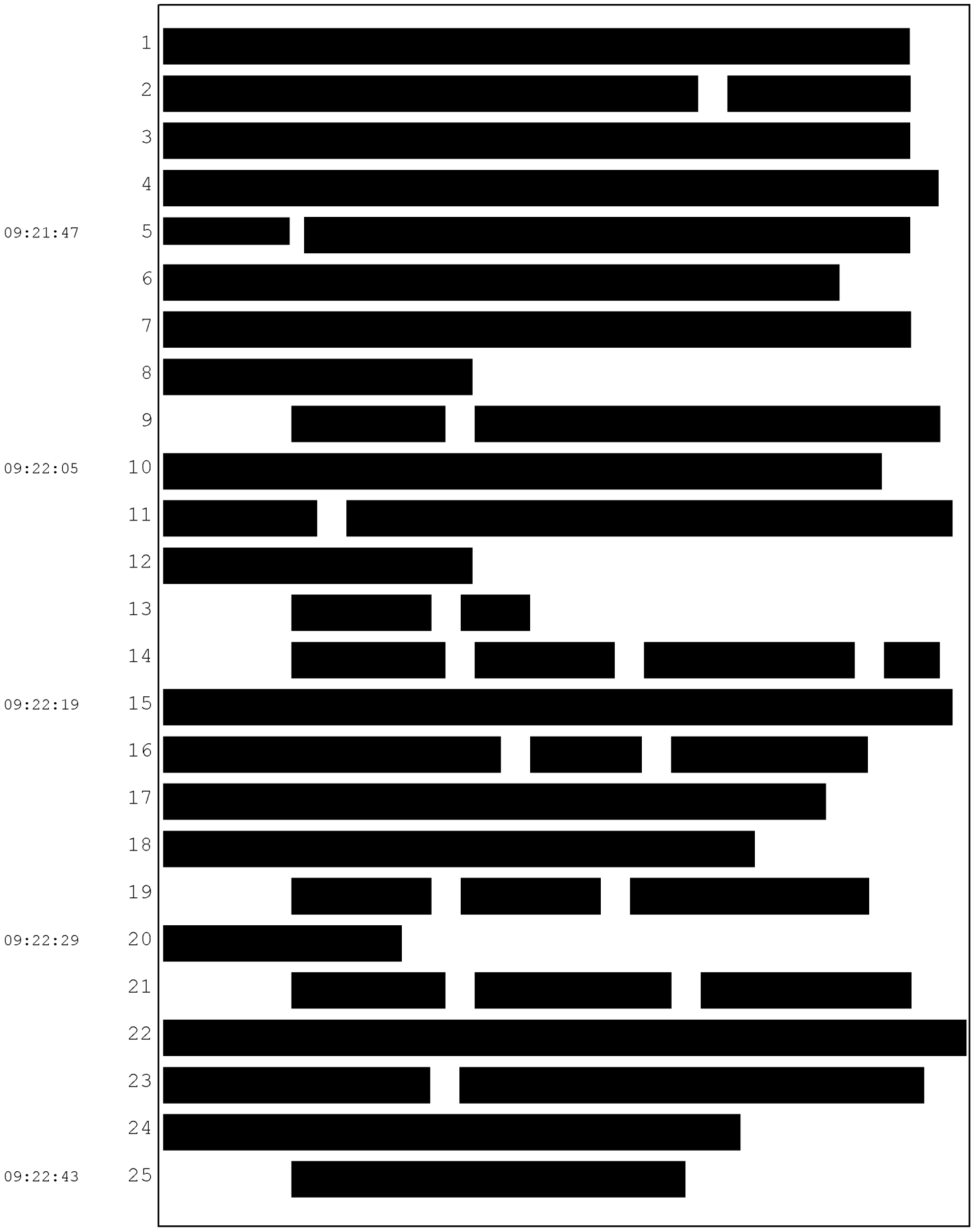
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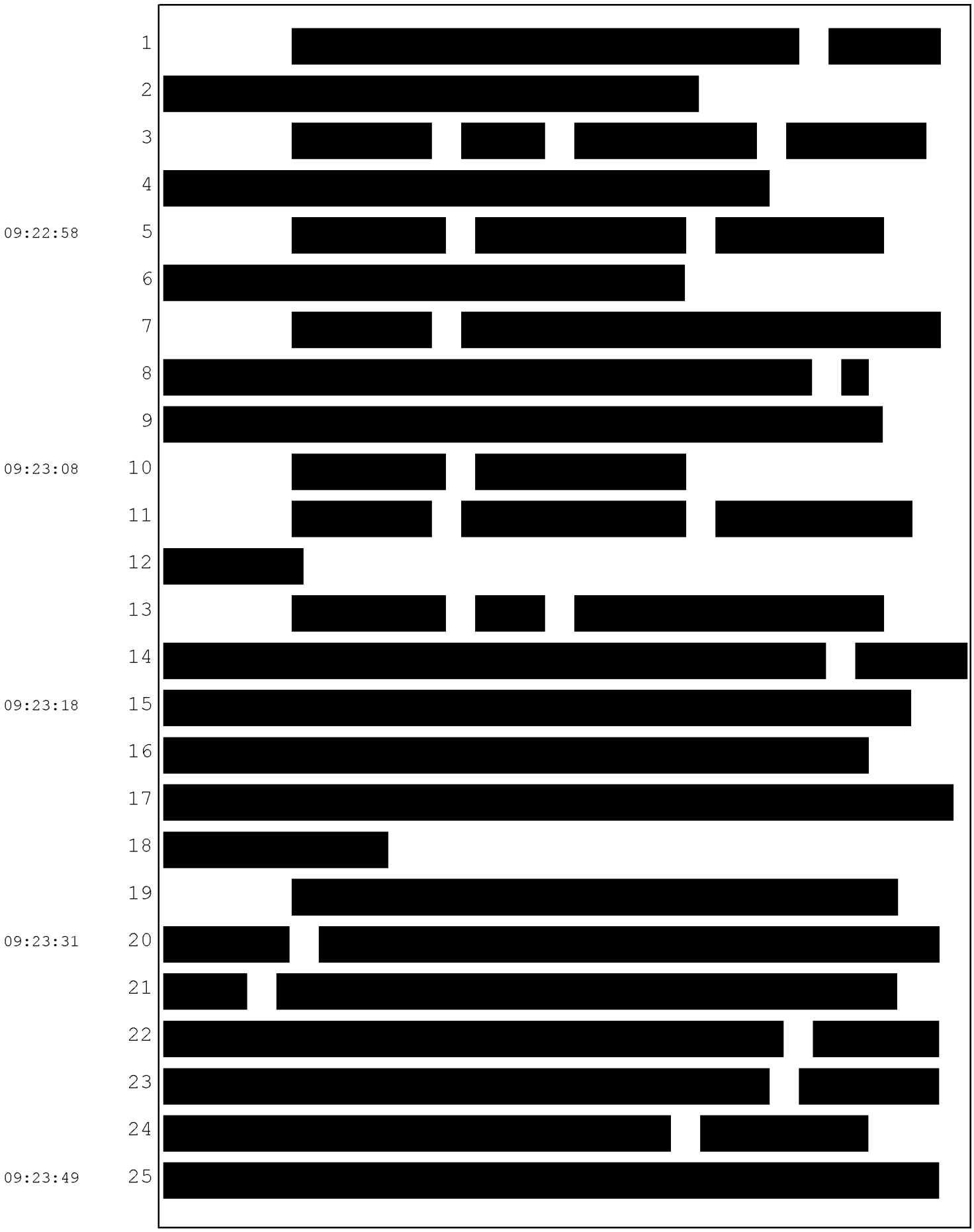
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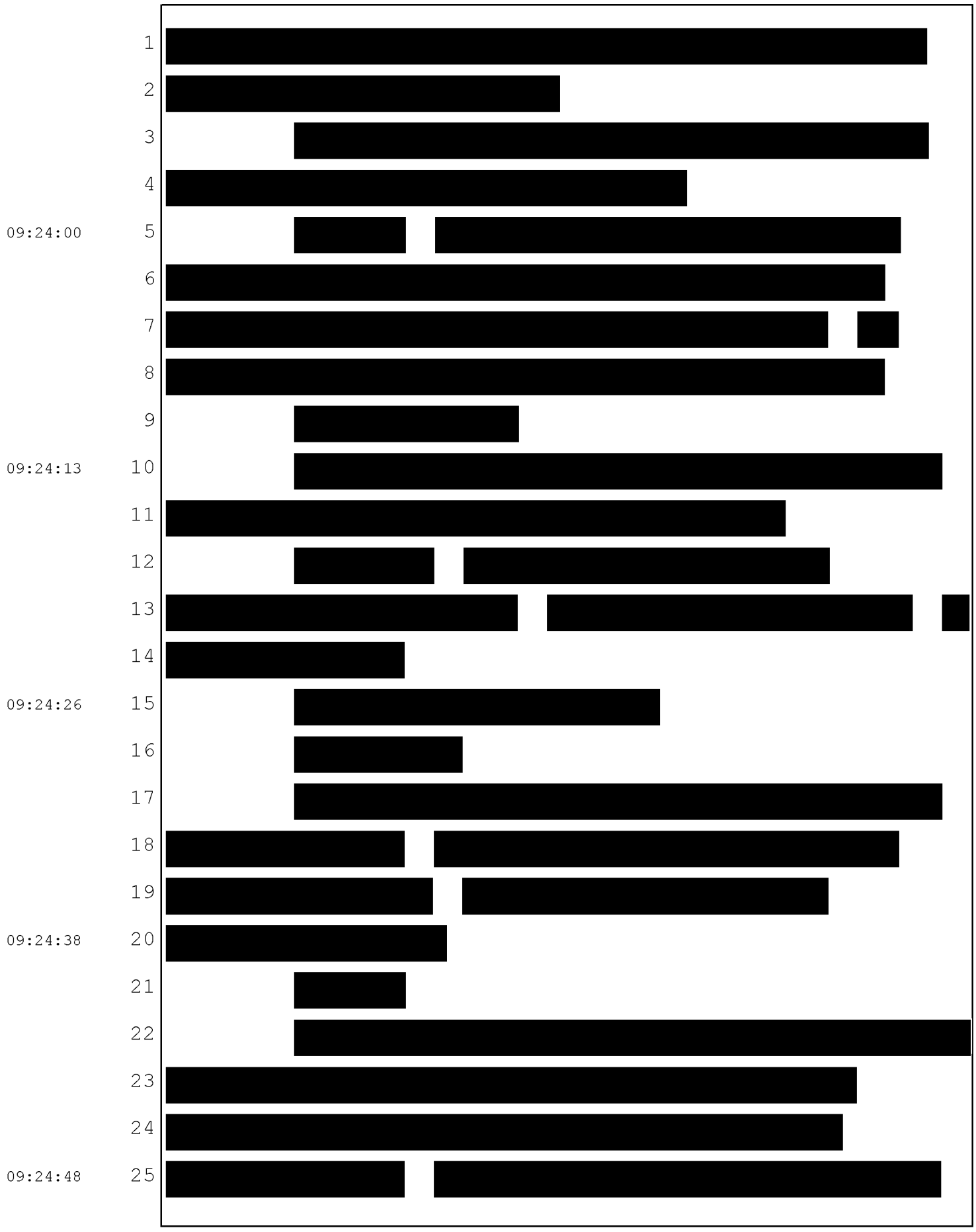
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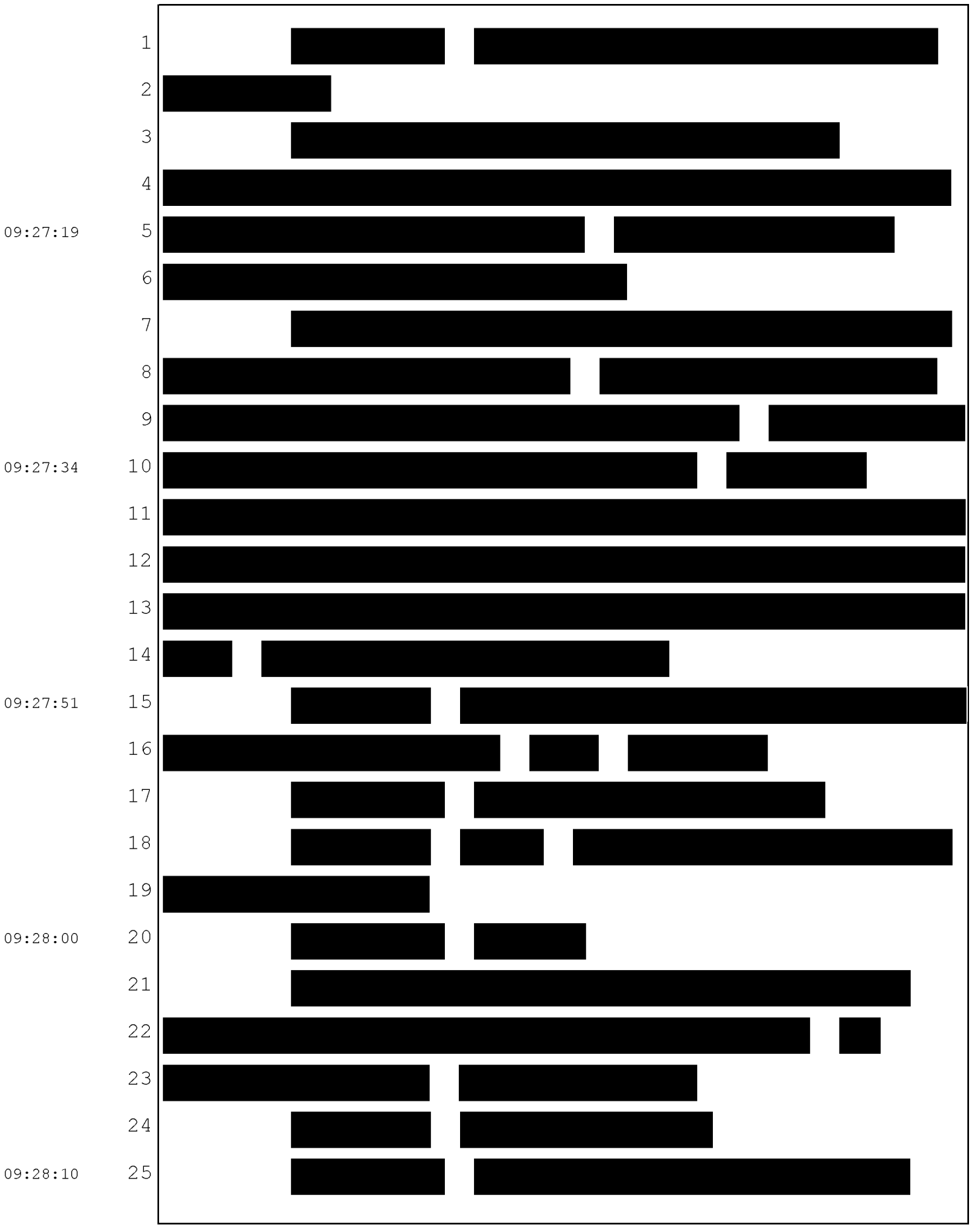
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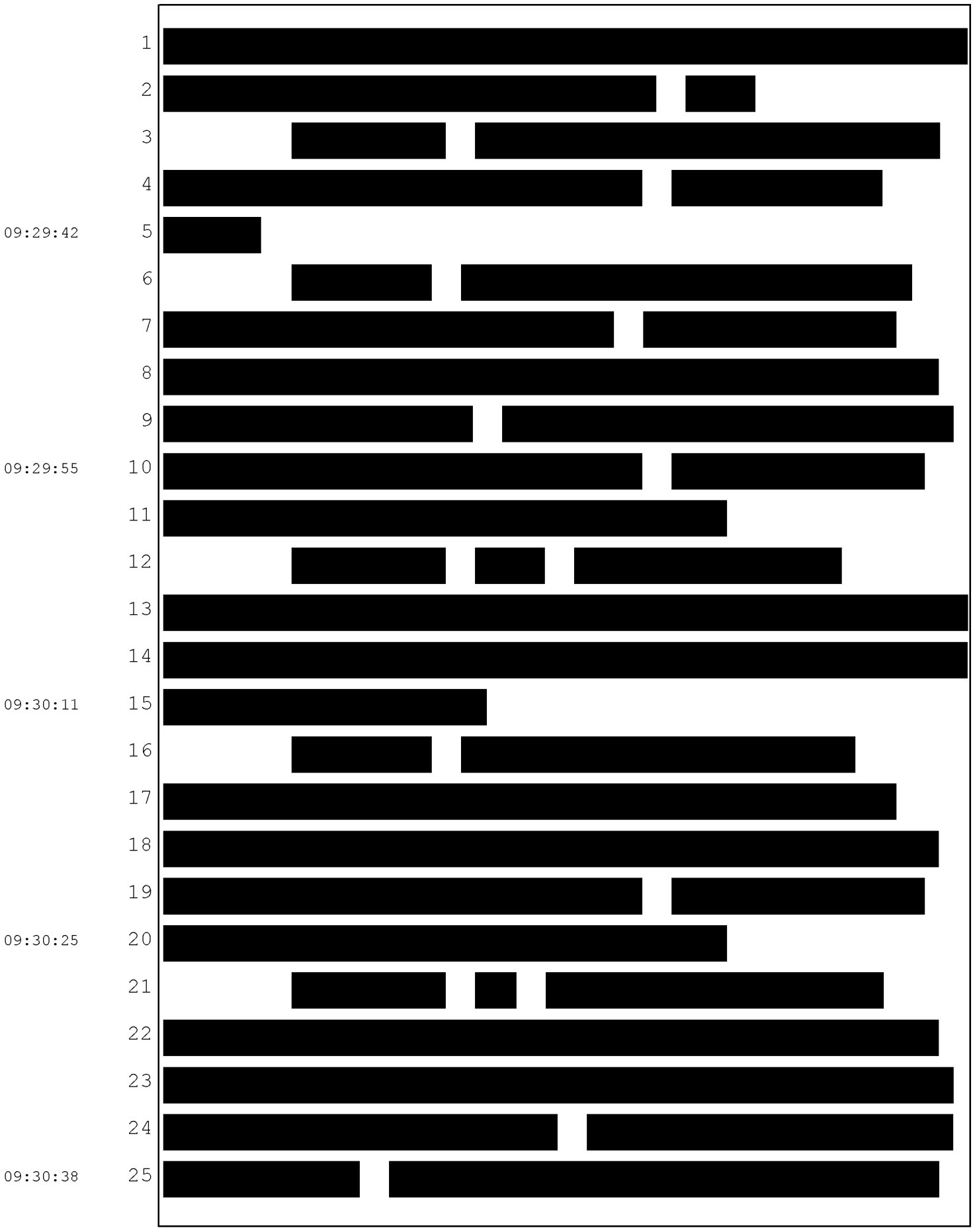
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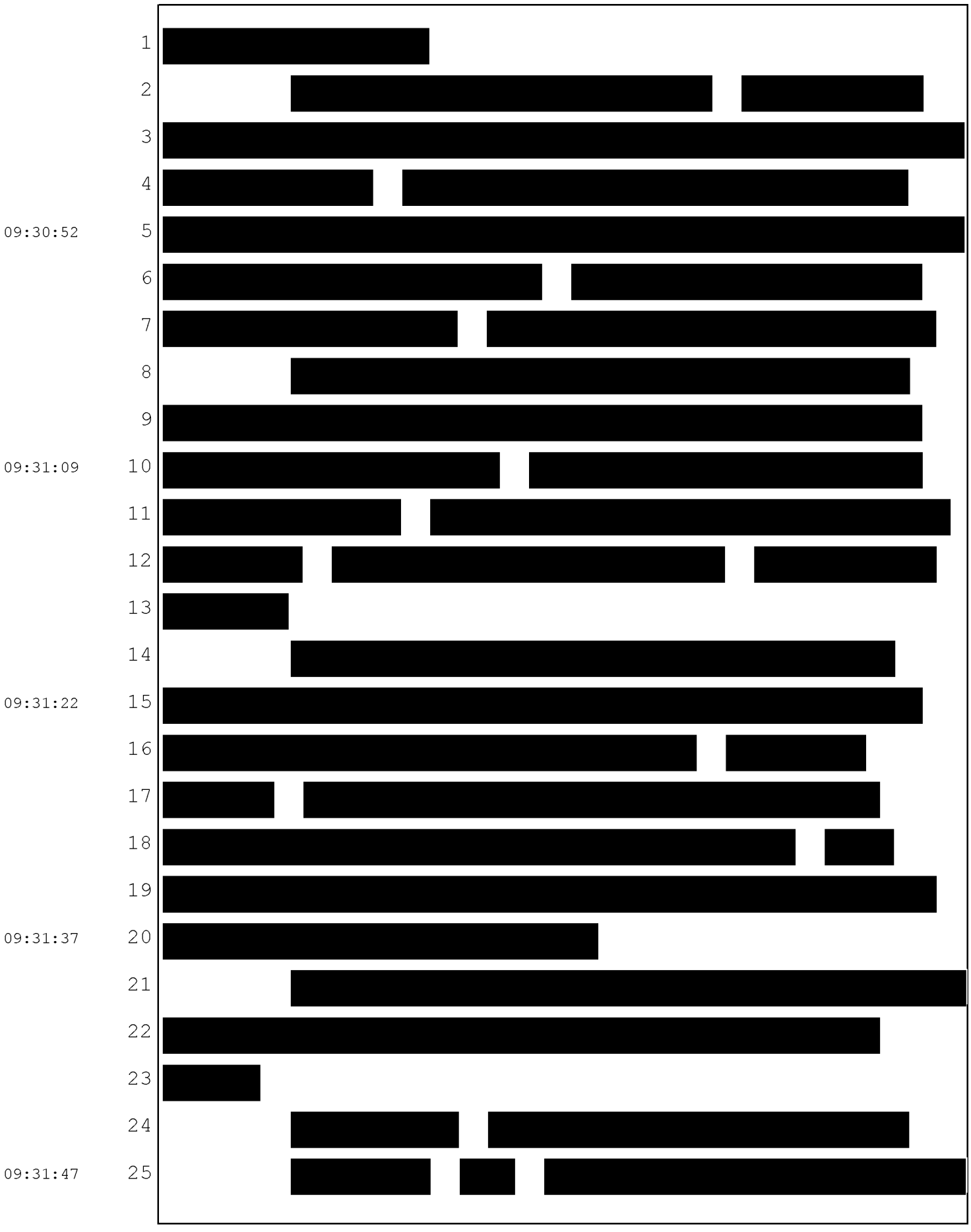
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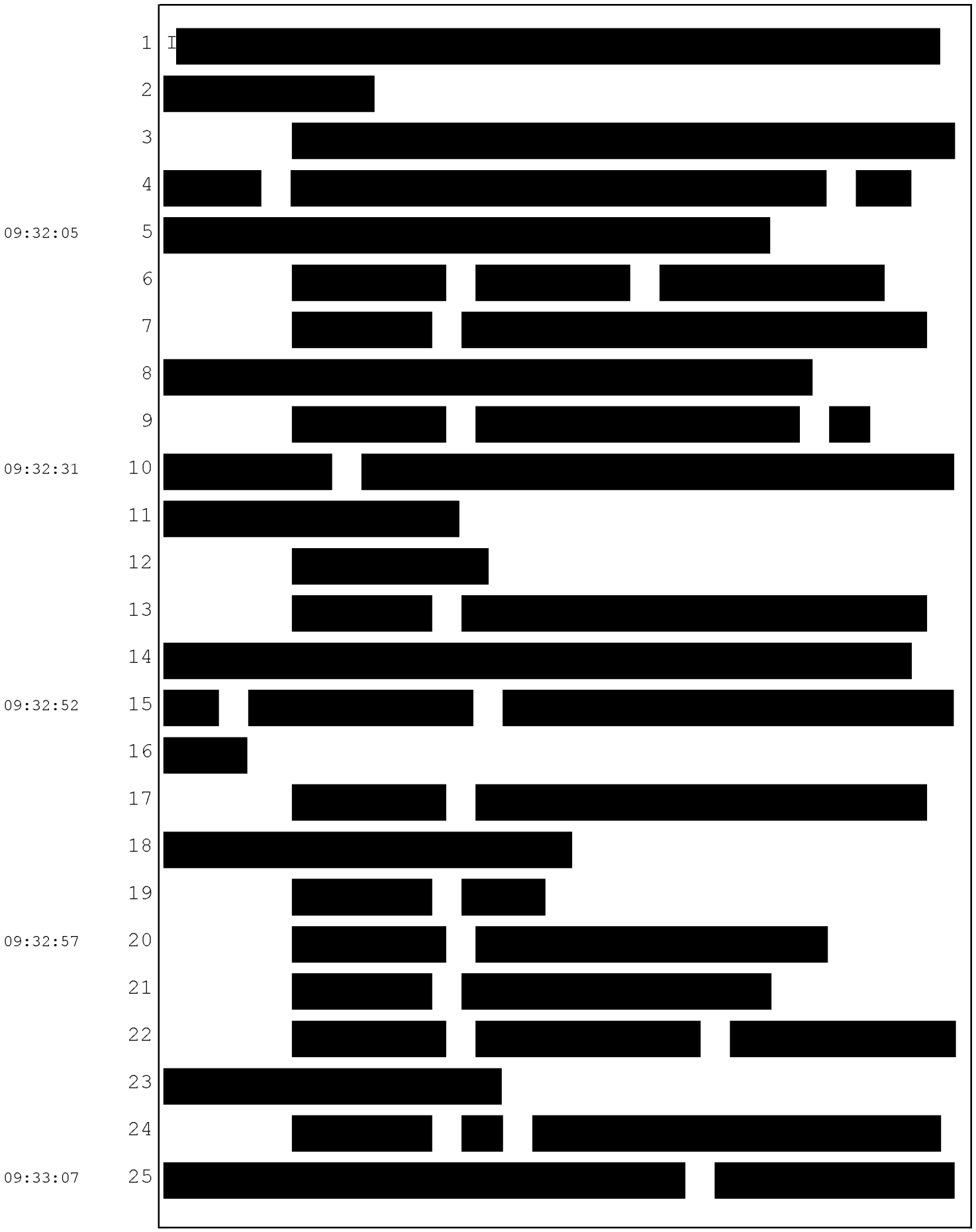
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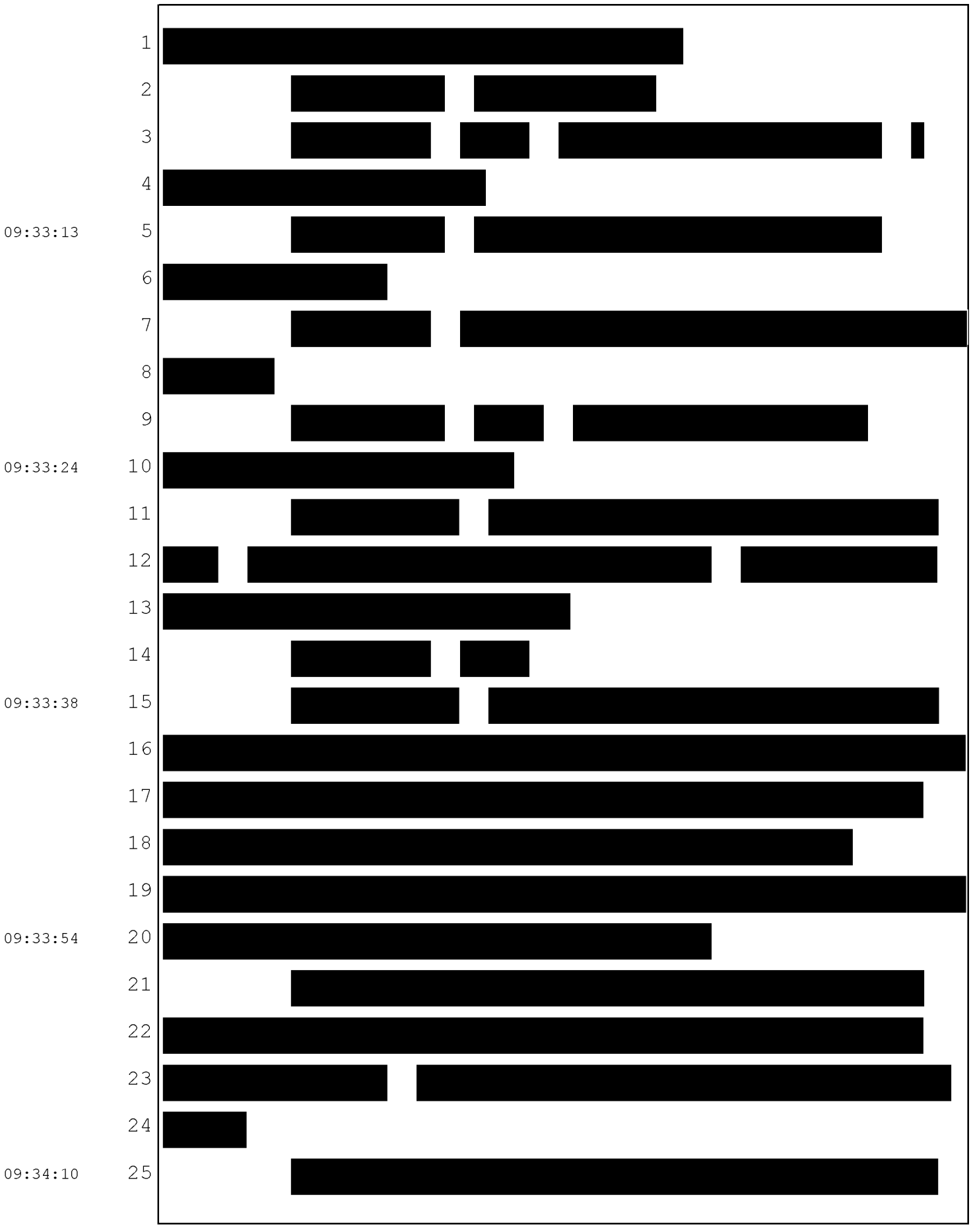
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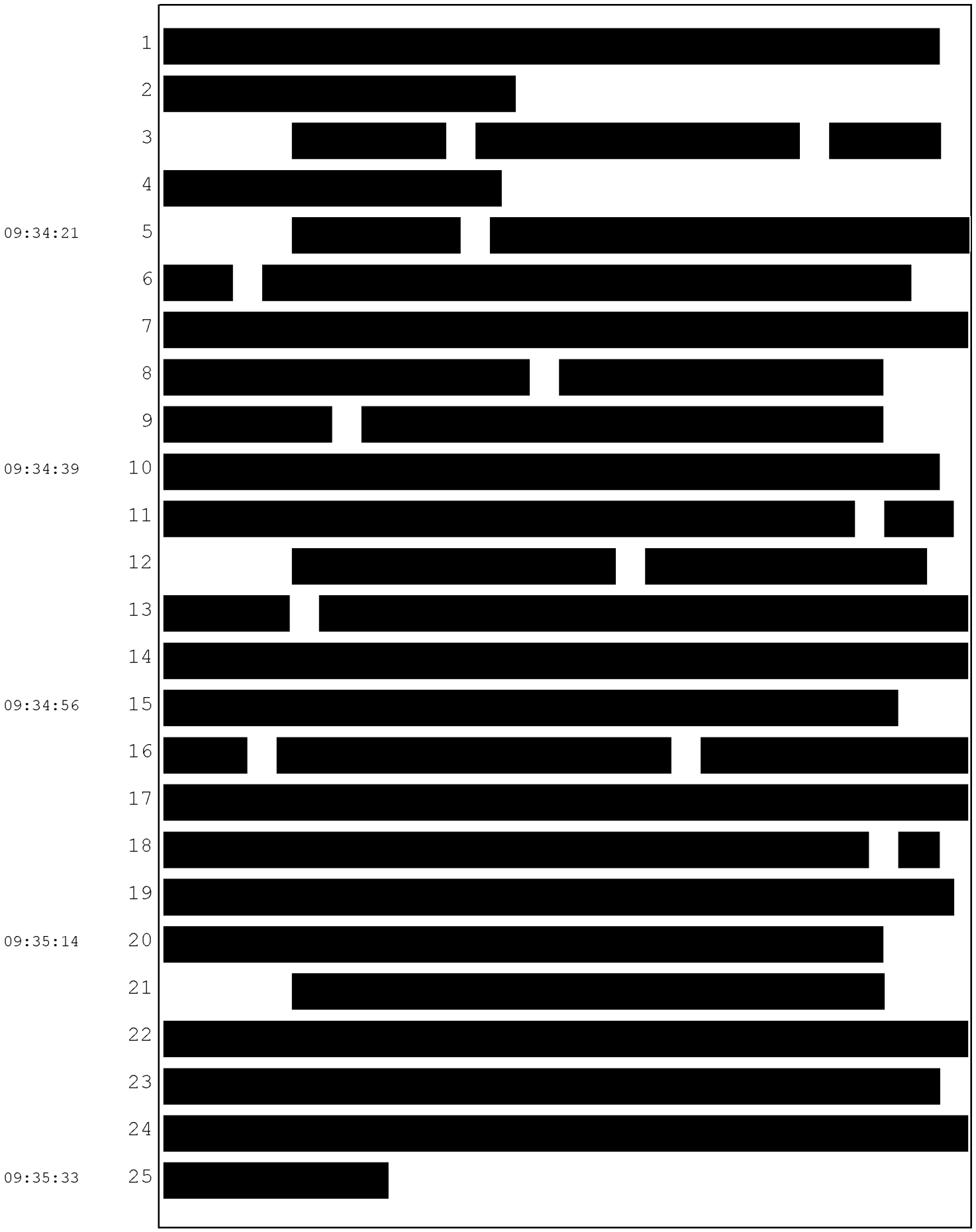
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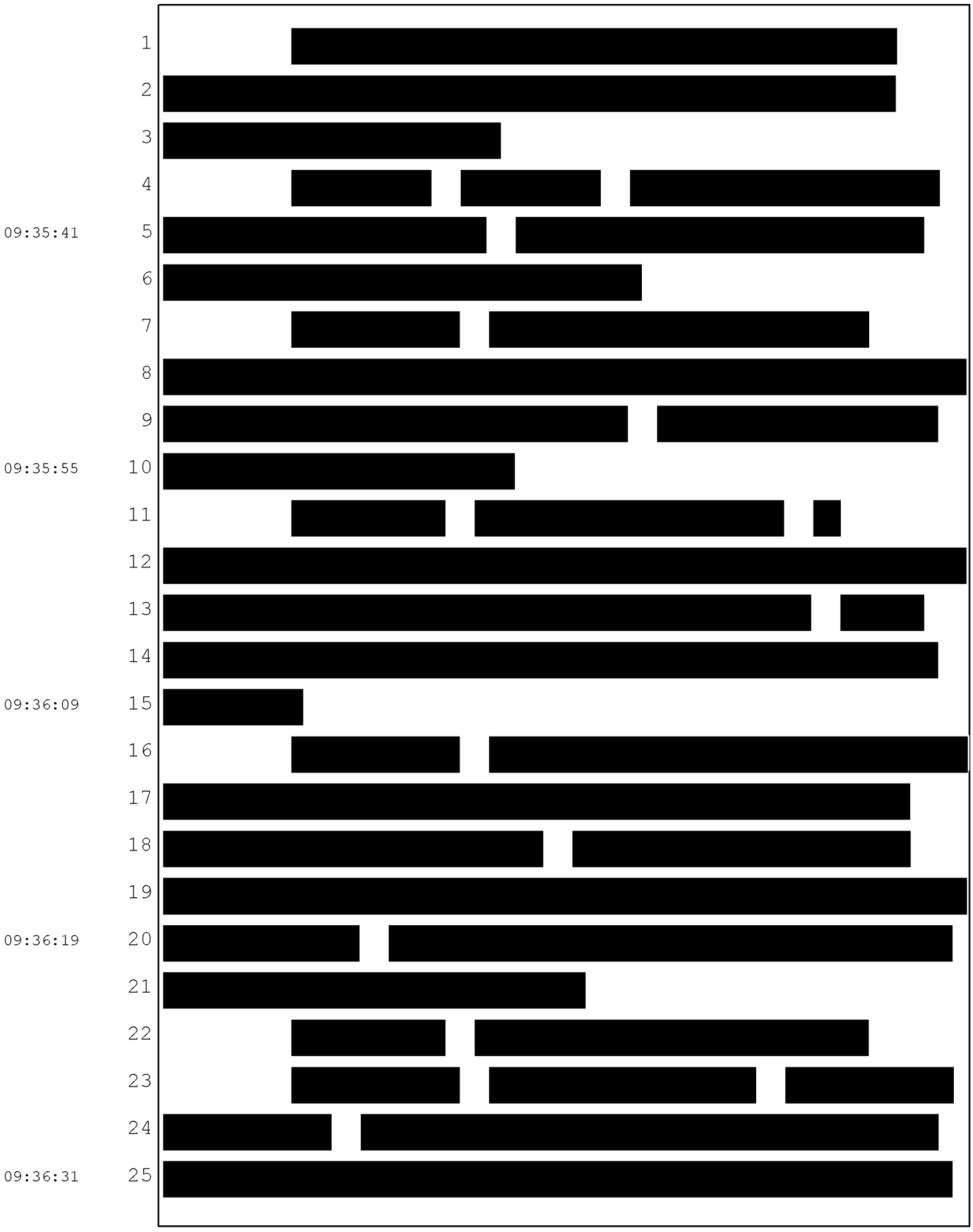
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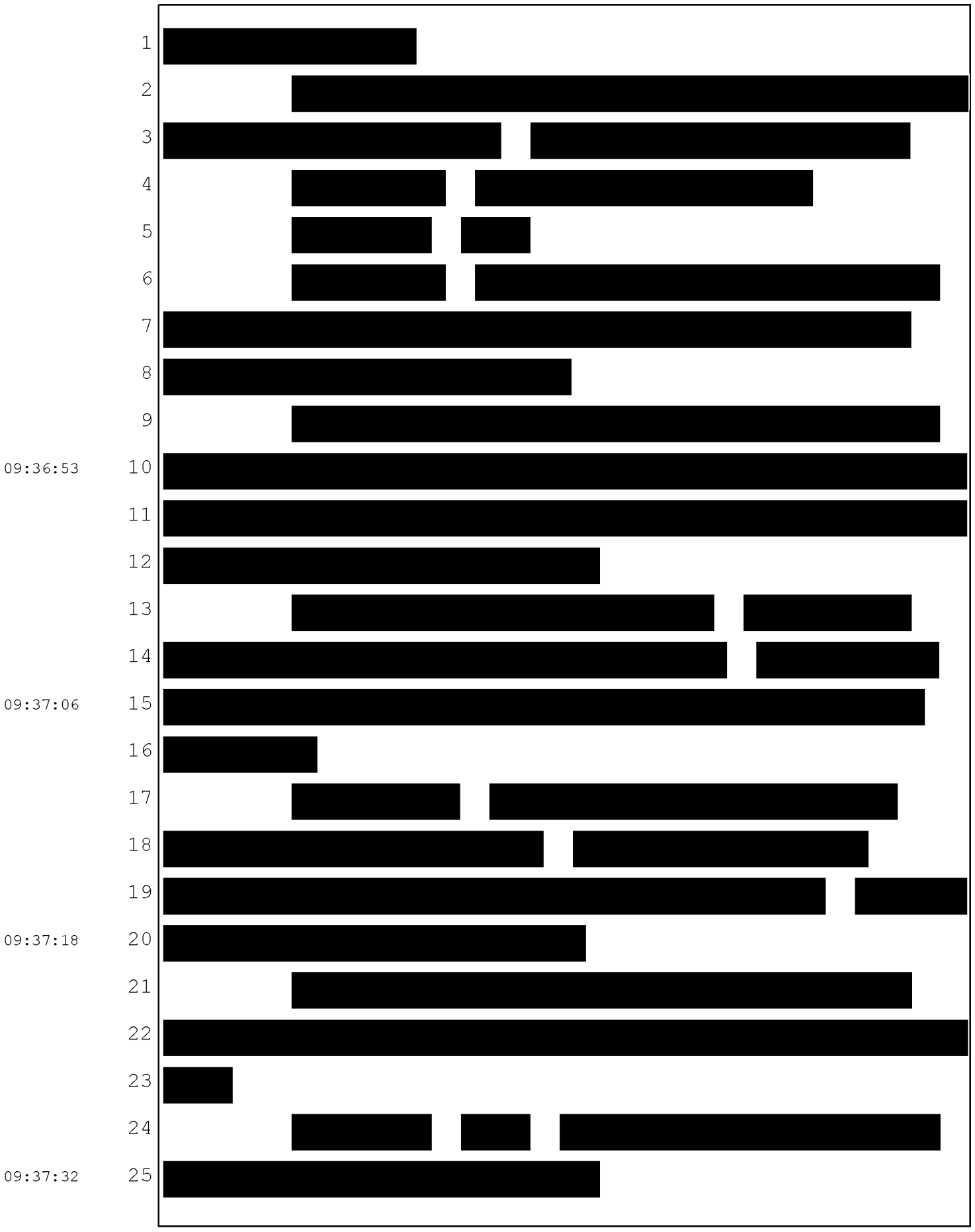
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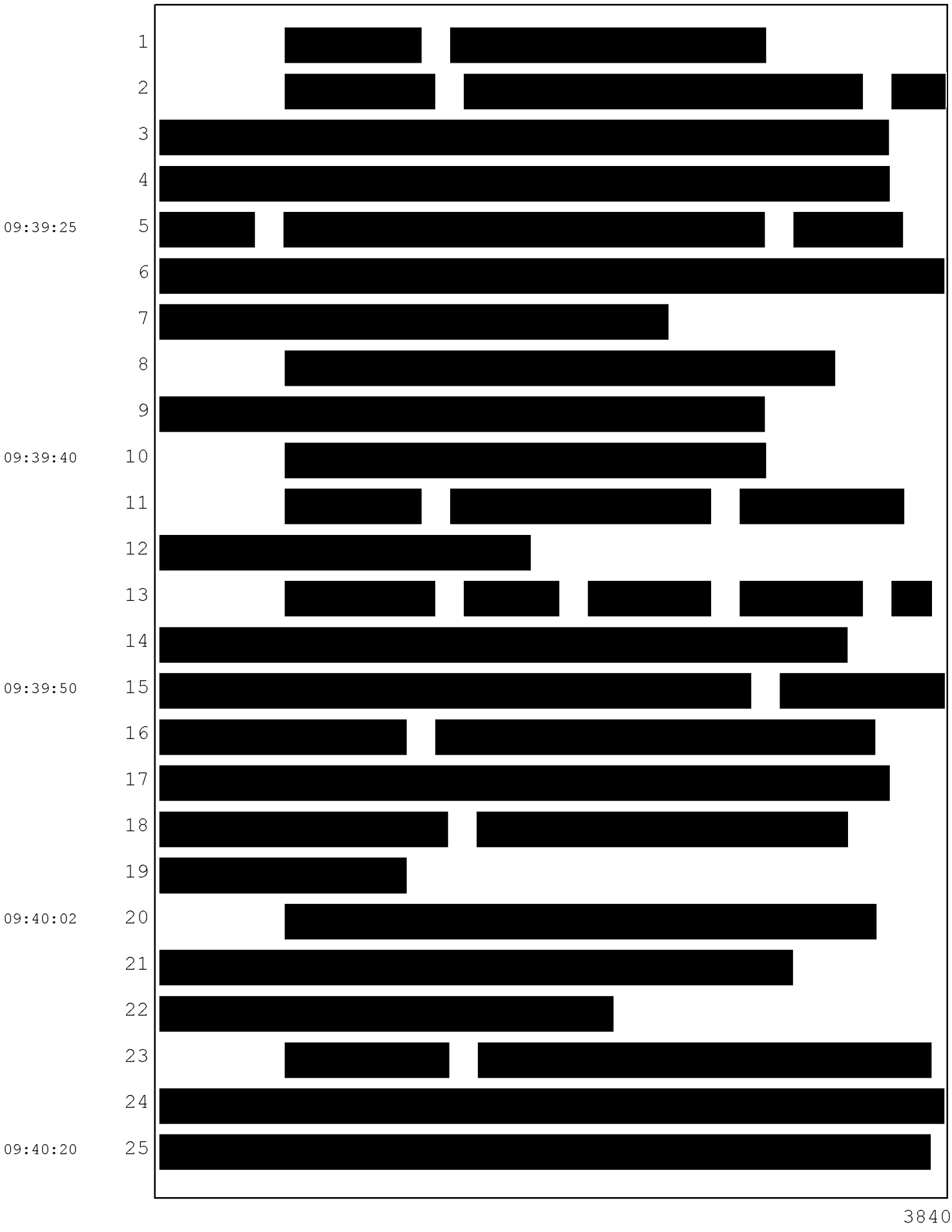
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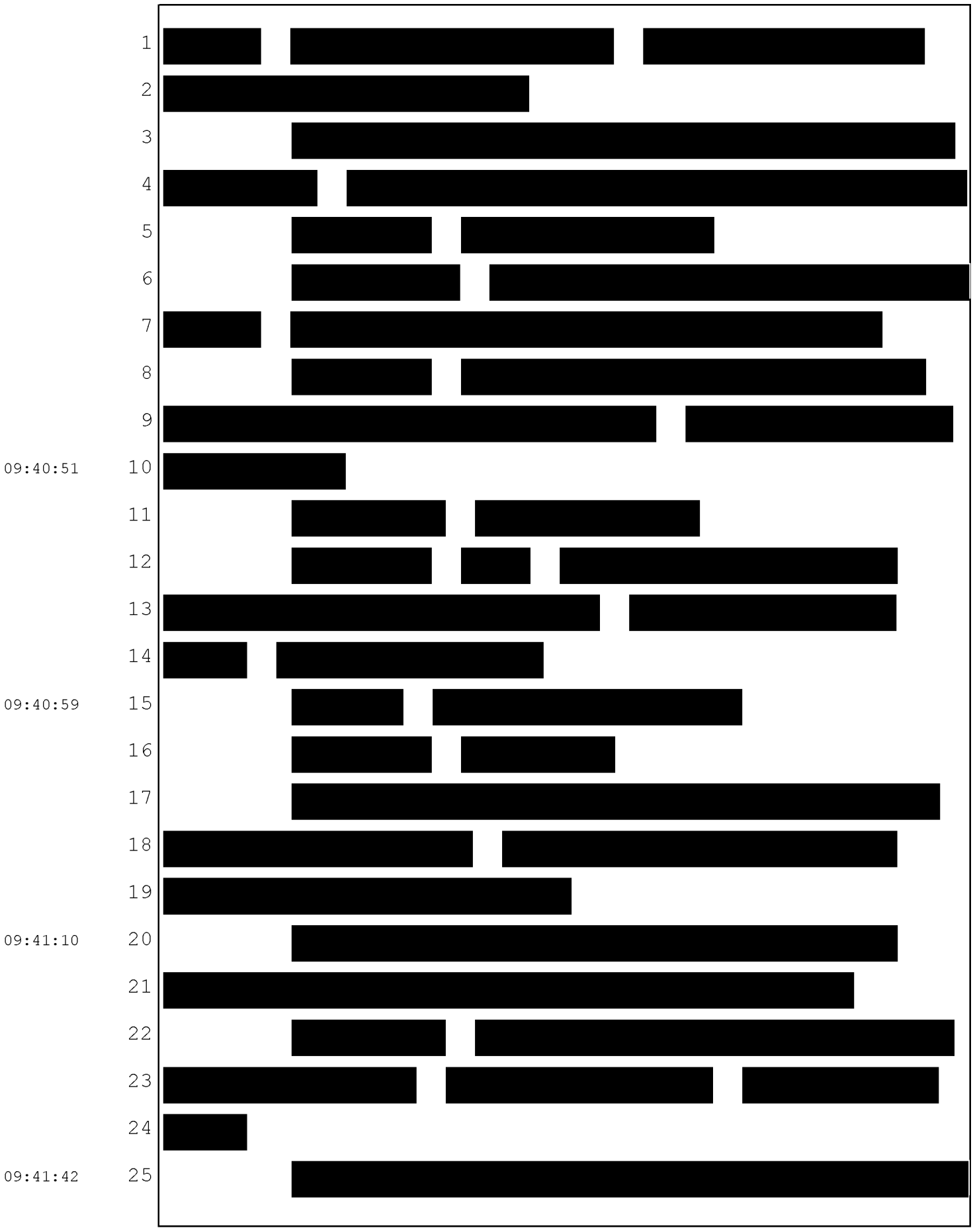
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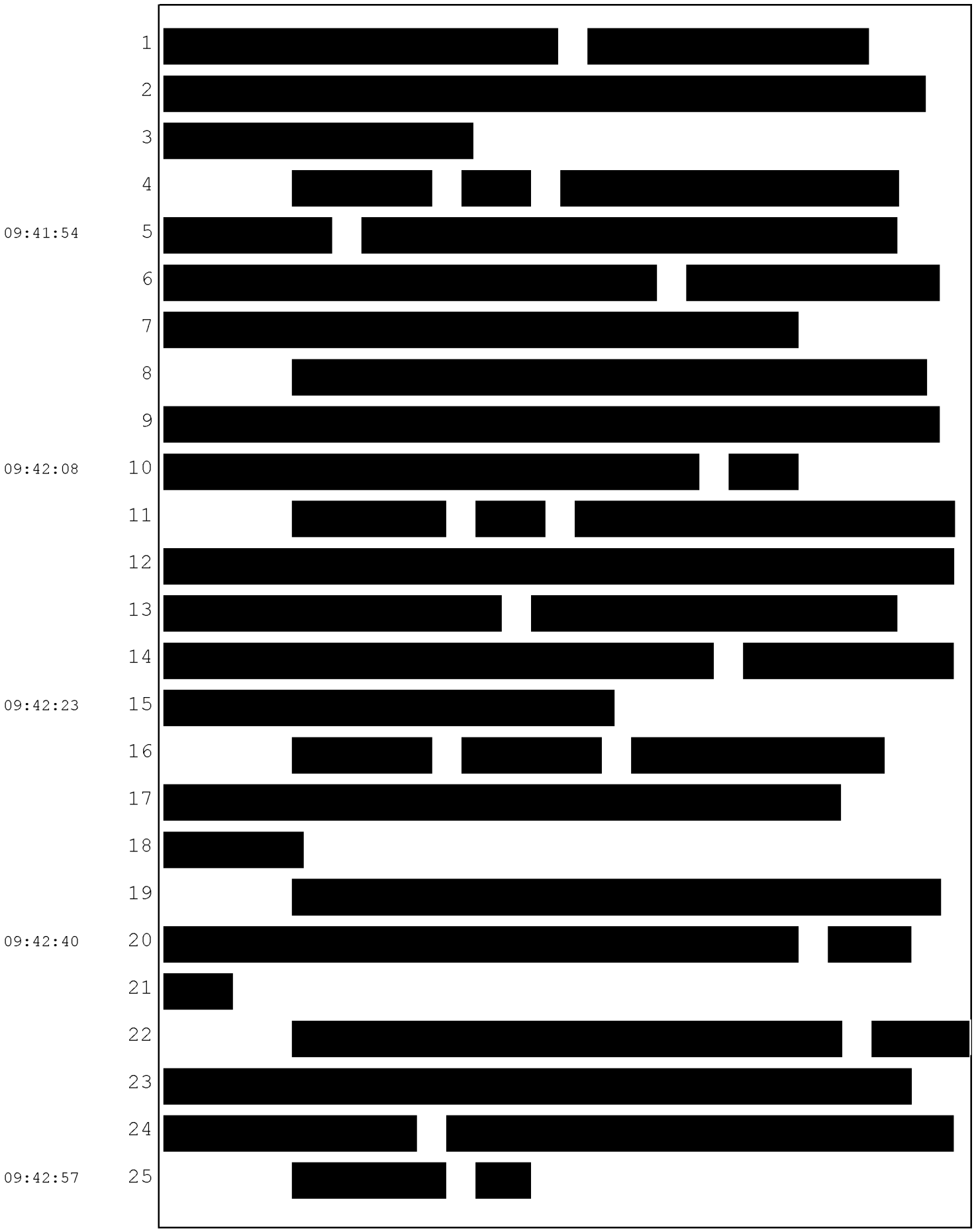
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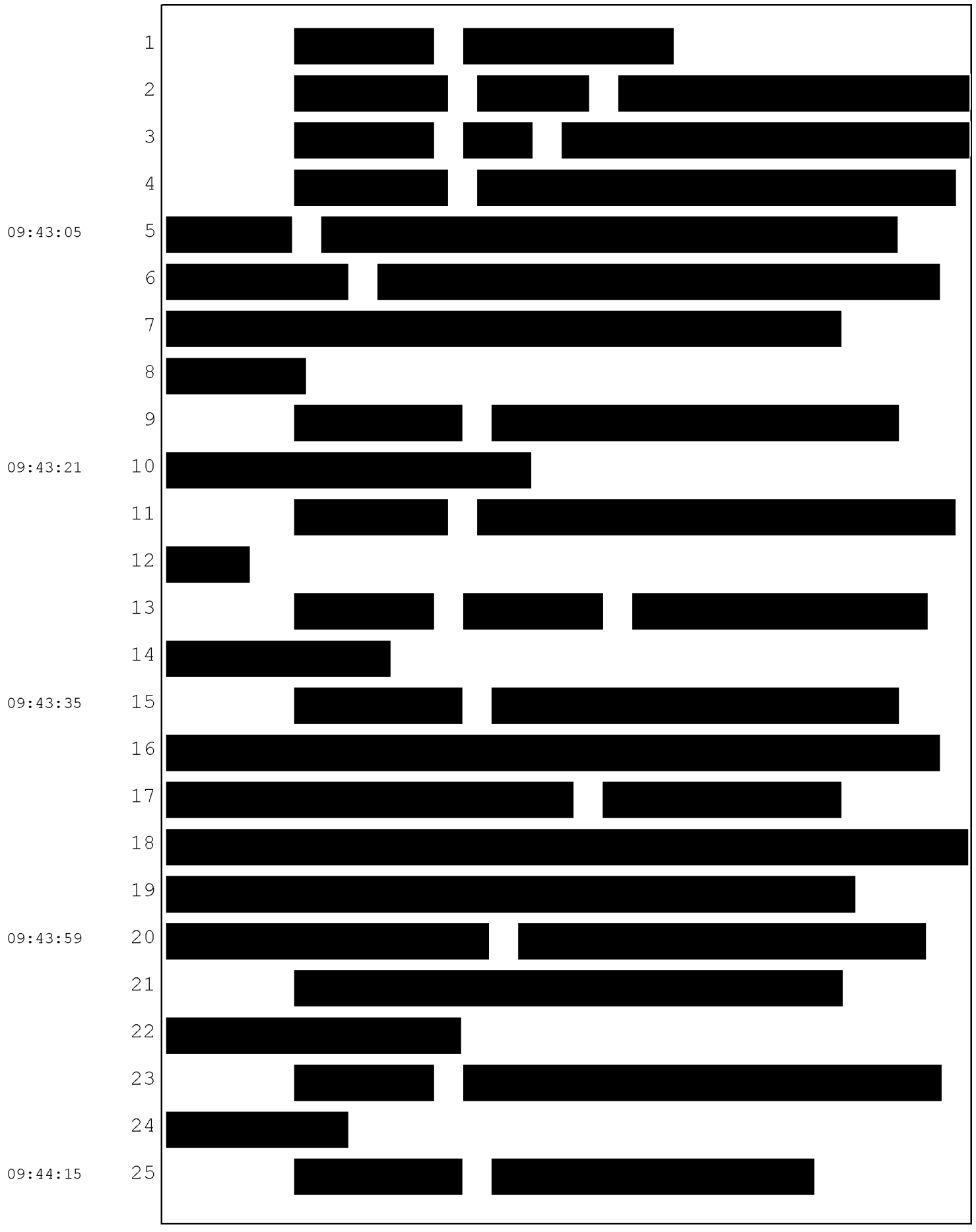
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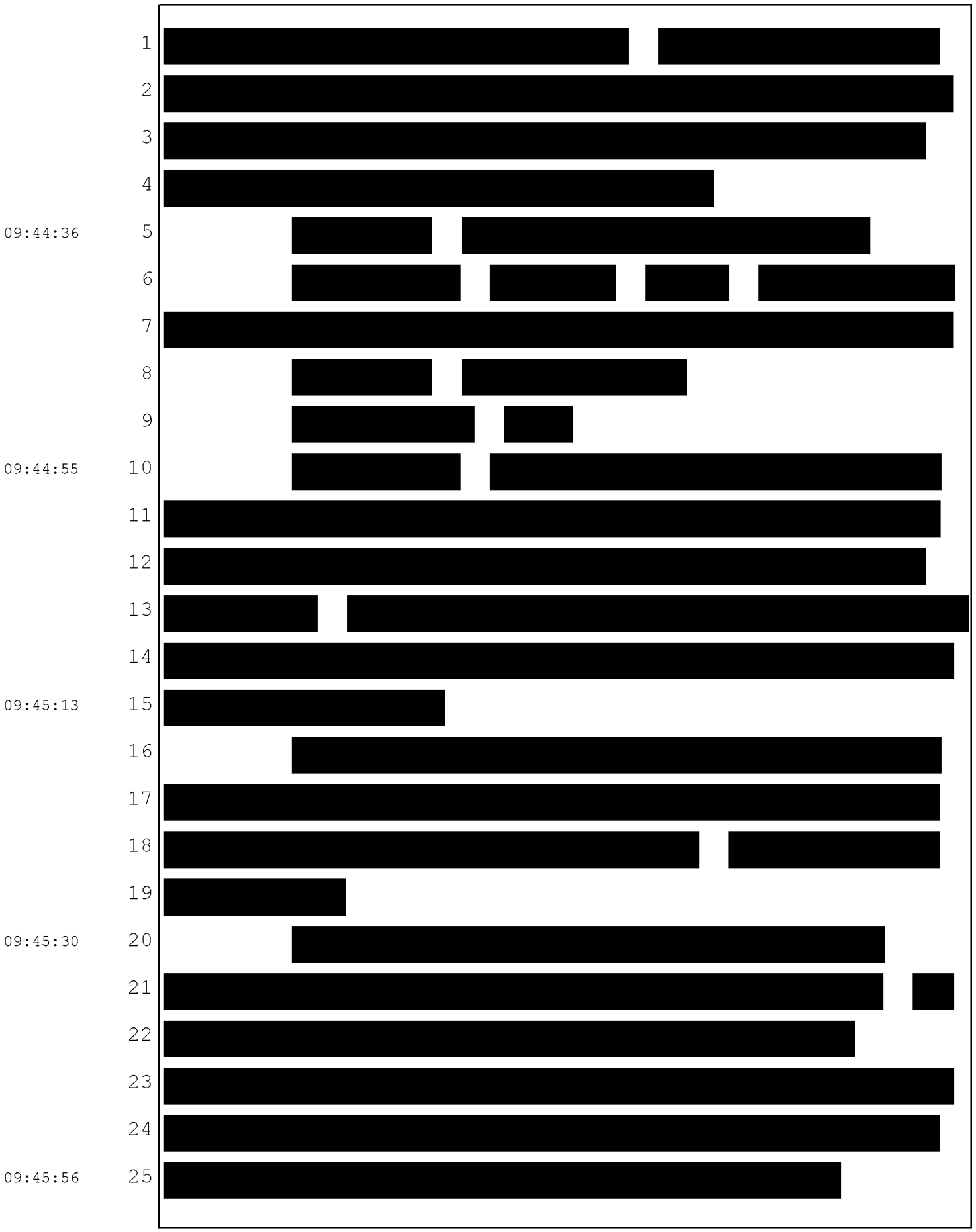
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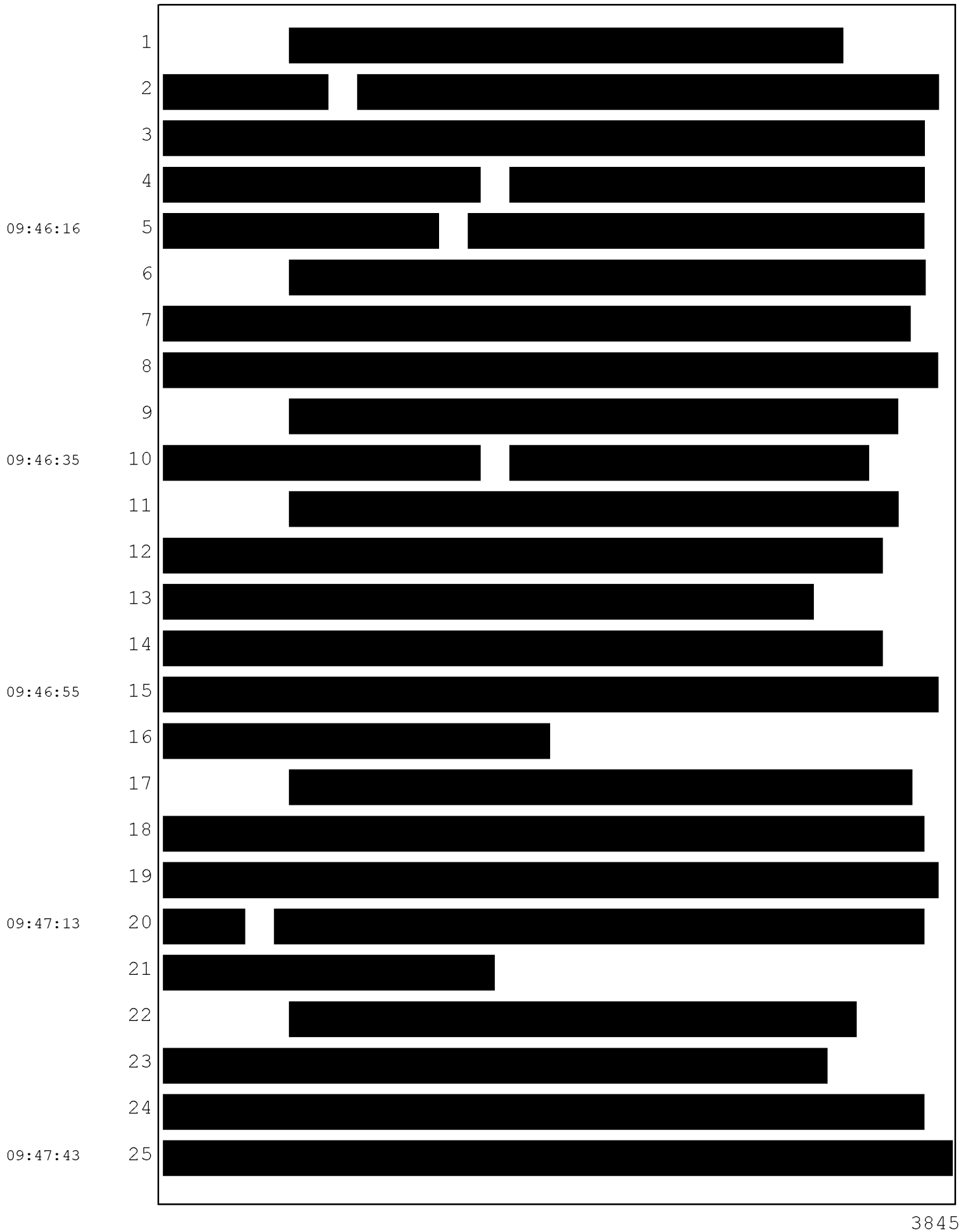
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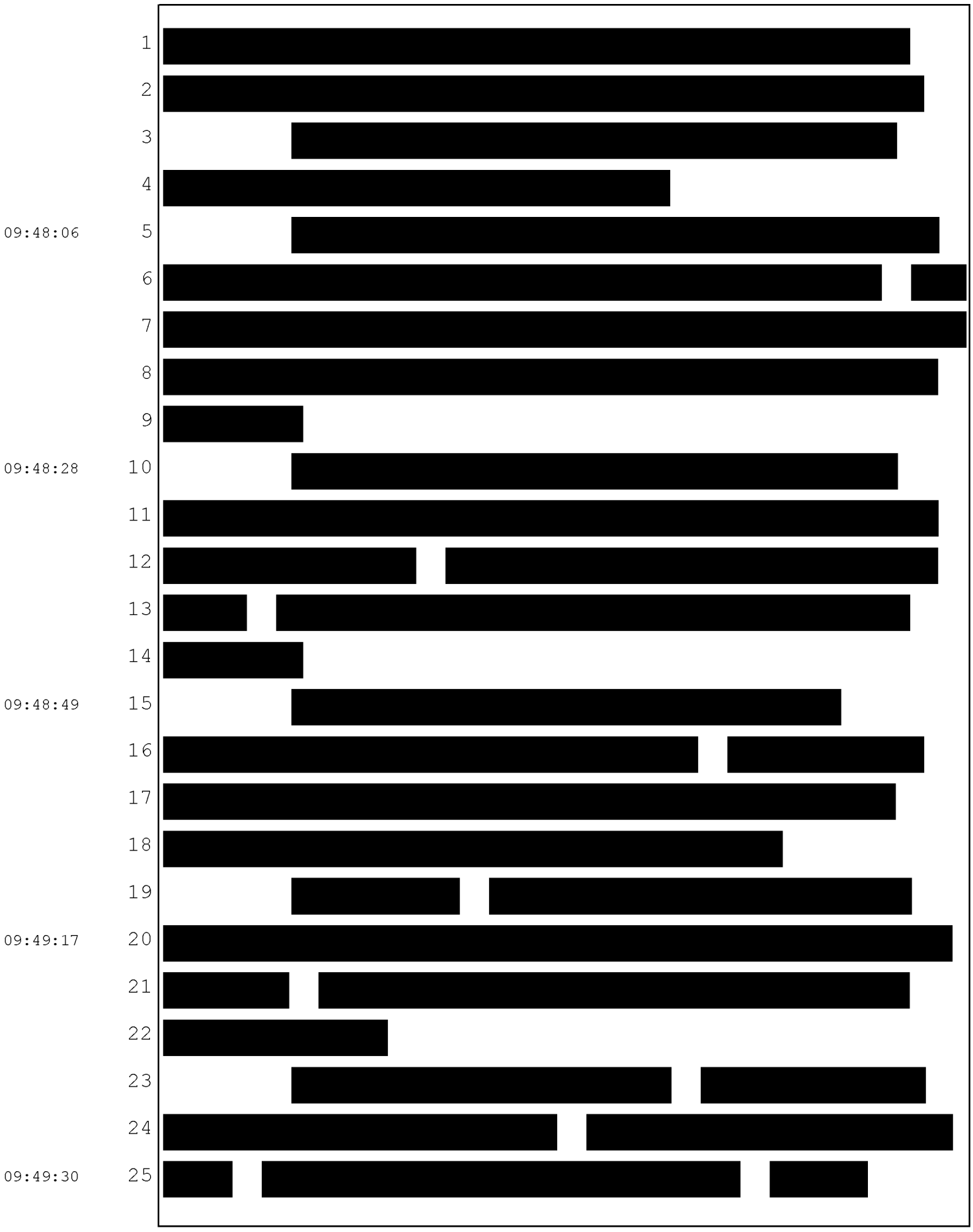
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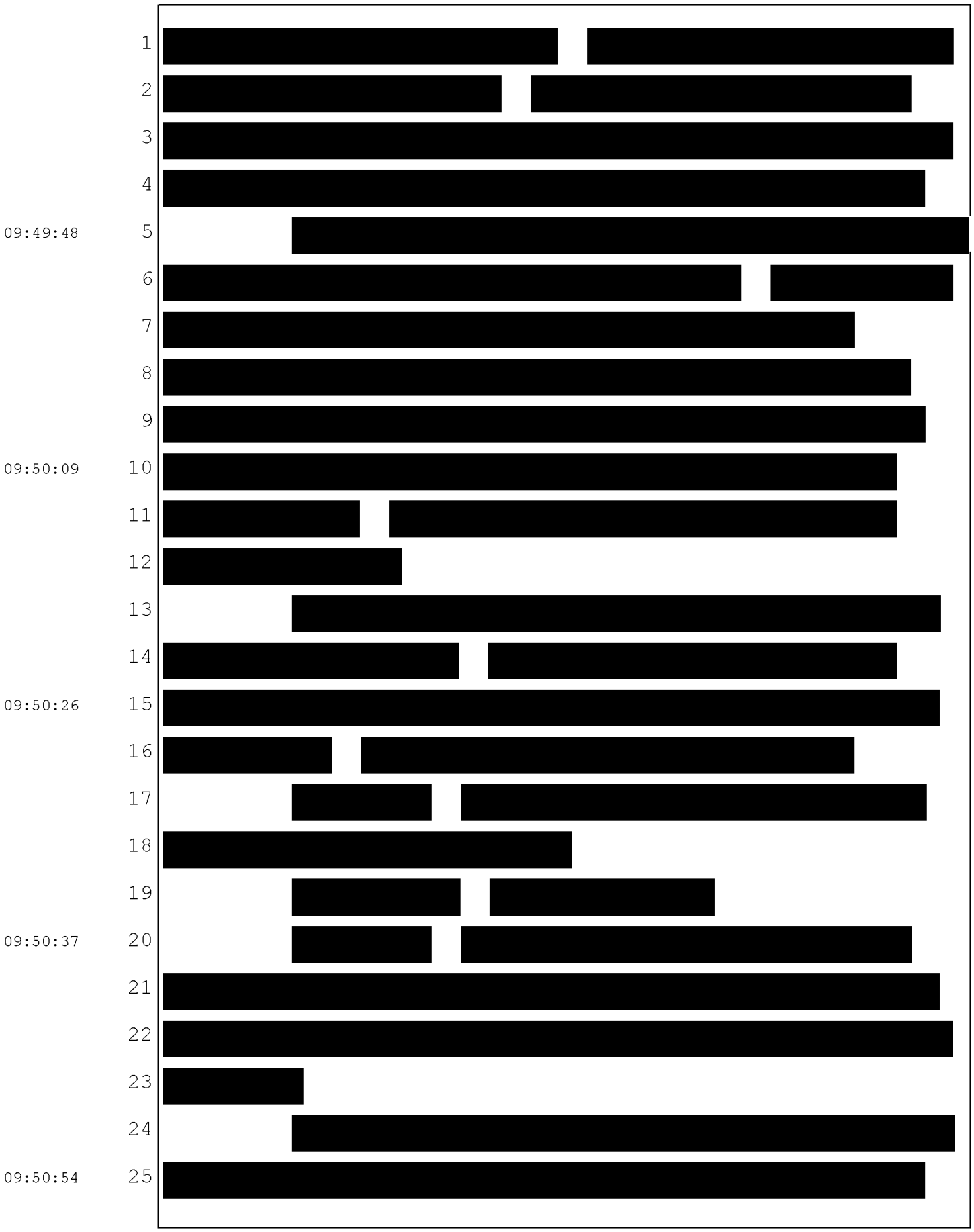
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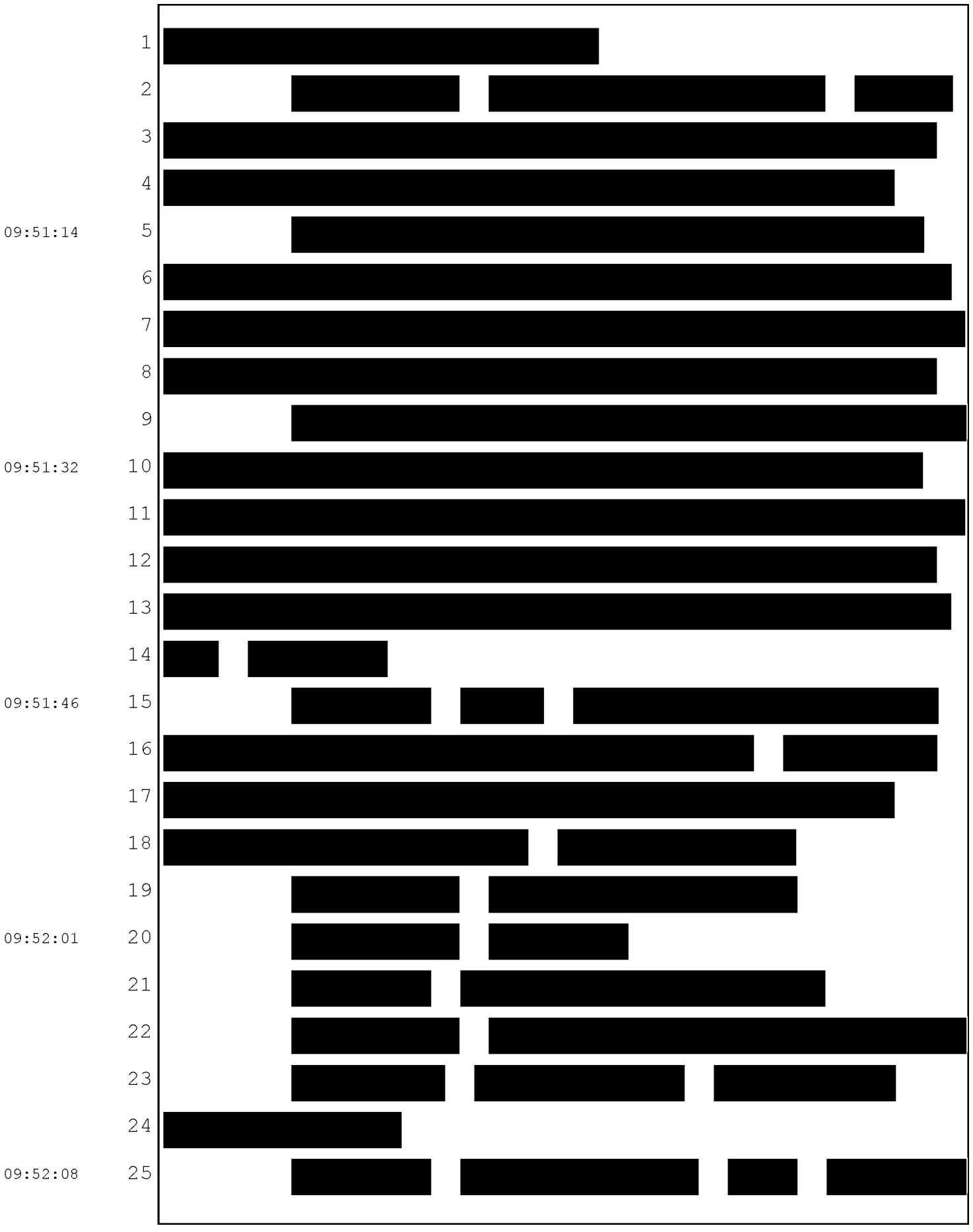
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[redacted]

(Jury enters courtroom.)

THE COURT: Good morning, Ladies and Gentlemen. Welcome back.

09:54:36 My apologies again for the late start, but I promise you that we are working very hard to try to streamline everything so it will hopefully go as smoothly as possible today.

Mr. Wisner, you may call your next witness.

09:54:49 MR. WISNER: Yes, your Honor.

Before we do that, we are going to read a few admissions into the record.

MR. GRIFFIS: I believe there's also an instruction to be read.

09:54:57 THE COURT: Oh, yes. Thank you for reminding me.

Before we proceed with the next witness, I did wish to read the following instruction to you: "Members of the jury, there are times when I make rulings that

09:55:09 prevent certain information from being presented to you for legal reasons. On those occasions, witnesses are barred from discussing the information or referring to the information. If information is not presented to you, it is because I have made that decision for legal

09:55:29 reasons. You should disregard any reference to

information that I have excluded and not speculate as to what that information is."

All right. Thank you.

Now you may proceed, Mr. Wisner.

09:55:44 MR. WISNER: Thank you, your Honor.

Good morning. I'm going to read you three admissions that have been made in this case.

"Admission Number 10: Request: Admit that Monsanto has not conducted a chronic toxicity study of

09:56:03 any of the glyphosate-containing formulations sold in the United States as of June 29, 2017.

"Response: Monsanto admits that after reasonable inquiry into the information that is known or reasonably obtainable, it has not identified any 12-month

09:56:22 or longer chronic toxicity studies that it has conducted on glyphosate-containing formulations that were available for sale in the United States as of June 29, 2017. But denies that Monsanto has not conducted toxicity studies of shorter durations, genotoxicity studies and other

09:56:44 tests on formulated glyphosate-containing products sold in the United States as of June 29, 2017.

"Monsanto also denies the request to the extent it suggests that Monsanto has not conducted chronic toxicity studies on glyphosate. Monsanto otherwise

09:57:03 denies this request."

"Admission Number 12: Request: Admit that Monsanto has never conducted an epidemiological study to study the association between glyphosate-containing formulations and non-Hodgkin's lymphoma.

09:57:27 "Response: Denied. Monsanto has conducted epidemiological studies on glyphosate-containing formulations, including the farm family exposure study. Monsanto admits that that has not conducted a study designed to examine specifically whether an association

09:57:46 exists between glyphosate-containing formulations and non-Hodgkin's lymphoma. However, multiple published studies conducted by others show no association.

Finally, "Admission Number 4. Request: Admit that after receipt of EPA's July 29, 1985, letter,

09:58:10 Monsanto stated that EPA's determination that glyphosate was oncogenic," quote, "'would have serious negative economic repercussions.'

"Response: Monsanto denies this request as written. Monsanto admits that the cited document dated

09:58:30 March 13, 1985, states," quote, "'Monsanto is concerned that even the initiation of formal regulatory action would have serious negative economic repercussions, which we believe are not justified by the scientific evidence.'

"Monsanto denies that this document was created

09:58:50 after Monsanto received EPA's July 29, 1985, letter,

MONGLY04269006-07. Monsanto otherwise denies this request."

With that, your Honor, we're ready to call our next witness.

09:59:12 THE COURT: Very well.

MR. WISNER: At this time, the plaintiffs call Dr. Charles Benbrook to the stand.

THE COURT: Good morning, Dr. Benbrook. If you could please step up here and remain standing. The clerk

09:59:26 will swear you in.

CHARLES BENBROOK,

having been first duly sworn, was examined and testified as follows:

THE CLERK: Would you please state and spell your name for the record.

THE WITNESS: Yes. Dr. Charles Benbrook, C-H-A-R-L-E-S, Benbrook, B-E-N-B-R-O-O-K.

10:00:01 THE COURT: Thank you.

You may proceed, Mr. Wisner.

MR. WISNER: Your Honor, may I approach with the binder and some water?

THE COURT: Yes.

10:00:17 MR. WISNER: Your Honor, I have one for the

court as well.

THE COURT: Oh, thank you.

DIRECT EXAMINATION

BY MR. WISNER:

Q. Good morning, Doctor. How are you?

A. Good morning, Mr. Wisner. I'm fine.

Q. I'd like to -- please introduce yourself to the jury, say where you live and what you do.

10:00:34 A. I live in Troy, Oregon, in the very northeast corner of the state. I'm glad to be down in San Francisco. I went to high school in Palo Alto.

Q. And what do you currently do for a loving, sir?

A. I'm a scientist that works on the impact of

10:00:50 agricultural production systems and toxicology on human health, the environment, agriculture production, economics of agriculture. And I've done extensive work over many years on pesticide regulation.

Q. Let's go through a little bit about your history

10:01:06 and background. Where did you go to college?

A. I went to Harvard University.

Q. And what degree did you receive at Harvard?

A. An economics degree.

Q. Was that a Bachelor of Science or Arts?

10:01:17 A. Bachelor of Science.

Q. What's the difference?

A. Well, if you get a degree in English literature, that's a Bachelor of Arts. And if you get a degree in physics or chemistry or biology or economics, that's a science, and they give you a Bachelor of Science degree.

Q. And after Harvard, did you go to graduate school?

A. Yes, I did.

Q. And where did you attend graduate school?

A. In Madison, Wisconsin. The University of Wisconsin at Madison.

Q. What did you study while you were there?

A. I studied agricultural economics.

Q. And did you get a degree from there?

A. Yes. I received a Master's and a PhD.

Q. And was that PhD specifically in agricultural economics?

A. Yes, sir.

Q. Can you please just explain to the jury what is agricultural economics? What is that?

A. Well, agricultural economists get involved with the costs and profits of farming, the cost of technology. And agriculture economists often get heavily involved in policy issues, commodity programs, crop insurance, pesticide regulation, trade, tariffs. All the things

that affect the -- the economics of either agriculture production at the farm level or the cost of food that General Mills or Kellogg has to pay or the cost of food at the grocery store.

10:02:42 Q. And when you were getting your PhD, what did you focus your studies on?

A. I focused my doctorate dissertation work on the impact of farm size and the growing concentration of farms getting bigger and bigger on the intensity of input

10:03:00 use and the environmental impact of farming.

So I used agricultural census data across counties and -- primarily in the midwest, corn/soybean country -- and looked at the relationship between average farm size and the pounds of nitrogen fertilizer applied,

10:03:20 the pounds of pesticides applied and what we knew at the time about the impact on the environment, on soil health, on water quality of those choices farmers were making.

Q. Now, Doctor, I'm a bit confused. Because my understanding is that people who graduate from Harvard in

10:03:38 econ, they go work on Wall Street. How did you end up in Madison Wisconsin studying agricultural economics?

A. Well, I had three small children, and the grandparents were in northern Illinois. And I applied to two grad schools, and I had to pick between Stanford and

10:03:54 Madison. And the grandparents won.

Q. Okay. After you got your PhD, what did you do?

A. I -- I was actually in the middle of my PhD program, and I kind of got recruited into an agriculture policy job in the Council on Environmental Quality in the Executive Office of the President at the end of the Carter administration.

I had gone to DC for a conference on soil and water conservation policy and had an opportunity to meet several of the people that were active in the issues that I was doing my dissertation on, actually. And several people told me about this job that was open in CEQ. They're, kind of, worker bee agricultural specialists, agricultural policy specialists. And kind of on a whim -- I mean, I was in the middle of my PhD program. I wasn't ready to enter the job market.

On a bit of a whim, I -- I went and talked with them about the job, and they were very desperate to get somebody in, because they didn't think there would be a second Carter administration. And, of course, they were right.

They kind of made me an offer I couldn't refuse. And they negotiated a deal with my academic department to make it possible for me to fly back and forth to DC and still finish my dissertation.

So I started my national federal agricultural

policy career at the tail end of the Carter administration.

Q. So it looks like the only thing that could beat out your grandparents would be President Carter; is that right?

10:05:32

A. Well, I suppose.

Q. Okay. So you worked there, and obviously President Reagan came into office. What happened then?

A. Well, I -- I had filled a professional analytical job -- it's called a Schedule C appointment -- in the federal government. And you serve at the pleasure of the president. And I, and essentially all of my colleagues in CEQ, were -- lost their jobs at -- on the day of the inaugural, when President Reagan came into --

10:05:42

10:06:02

came into office.

Q. And after working for the Council on Environmental Quality, what did you do next?

A. I was very fortunate. It was a long time ago. I'll just remind people the republicans won the executive branch, so, you know, EPA -- they also won control of the senate. But the democrats retained a majority in the house. And there was a sub-committee of the house ag committee that had a new chairman that was hiring staff. It happened to be the sub-committee of the house ag committee that dealt with agriculture research, trade,

10:06:22

10:06:41

oversight of all of the USDA. And it also had jurisdiction over a federal law called FIFRA, which is the Federal Insecticide, Fungicide, and Rodenticide Act that -- the national pesticide law. And, really, just by
10:07:02 accident, I was responsible for managing reauthorization of the FIFRA statute.

Q. Now, Doctor, the court reporter is looking at me concerned, because I speak really quickly, and you speak really quickly. And if we both start speaking really
10:07:22 quickly, our heads will explode. So let's both make an effort to slow down.

A. Okay.

Q. All right. So while you were working at this sub-committee, what are some of the issues that you were
10:07:33 working on in that official capacity?

A. The primary issues were pest management and pesticide use related. The Council on Environmental Quality in the Carter administration actually put out the first national report on something called integrated pest
10:07:49 management or IPM. That term would have come up in the course of this trial. That was a very important report that had an influence on federal policy for a number of years.

We did a lot of work on soil and water
10:08:02 conservation policy. And a third issue that I ended up

spending a lot of time on was the conversion of agricultural land to suburbs and commercial development.

And at the end of the Carter administration, one of the reports that I think we got out the day before the 10:08:20 inaugural was called the "National Agricultural Land Study." Very -- first national study of that. I spent a lot of time working on that.

Q. You mentioned earlier that one of the issues that your committee worked on was FIFRA; right?

10:08:35 A. Yes. Back when I was the staff director of the congressional sub-committee, correct.

Q. And did you specifically, in your official capacity, work to help amend, change or analyze FIFRA as it's being applied?

10:08:49 A. Well, sure. That was the responsibility of the sub-committee. Our sub-committee had to consider and pass any authorizing legislation that would just keep FIFRA going, without changing it or amend it to address additional issues.

10:09:09 And, you know, much like today with the Trump administration, with the Reagan administration coming in, there was a strong push to amend, really, all of the federal environmental statutes.

So our sub-committee had to deal with that 10:09:25 deluge of proposals to change federal environmental law.

Q. Was one of the jobs of the sub-committee to organize hearings?

A. Yes, sir.

Q. And at that time, did you ever organize any hearings specifically related to pesticides?

A. Several.

Q. Now, Doctor, let's kind of take a step back in time for a second. So we're talking 1981, 1983; right?

A. Correct.

Q. What's going on in the country agriculturally and pesticide-wise at this time in history?

A. Well, it happened to be a -- a time of low crop prices. There was a lot of financial stress in agriculture. And there's pressure to cut the budget. There was a lot of pressure to deregulate, just like there is today, to provide farmers with easier access to technology.

And the political appointees in the EPA brought in by President Reagan really went after the FIFRA statute in a -- in a big way, to try to change some of the fundamental provisions in it governing the review and registration by EPA. And in particular, in the case of cancer-causing pesticides.

Q. And as part of these hearings that you helped organized in this committee, did you ever have the

occasion to work with a guy named Dr. Aaron Blair?

A. Yes. In our -- we decided to hold a hearing on federal government policy addressing cancer-causing pesticides, and so we invited -- people from EPA

10:11:10 testified. Of course, they had the responsibility for doing risk assessments on cancer-causing pesticides, making regulatory decisions, deciding whether to approve tolerances or reduce tolerances or eliminate them. So we had EPA people.

10:11:27 We invited -- I -- on behalf of the sub-committee, I called the National Cancer Institute up and said, "You have a large epidemiology program involving pesticides. You" -- the National Cancer Institute ran some of the most important studies on

10:11:49 oncogenicity, so I asked if a representative could come and testify to our sub-committee, and they agreed, and that's when I met a young epidemiologist named Dr. Aaron Blair.

Q. And the jury's heard a lot about Dr. Blair, but

10:12:05 it's your understanding as well that he chaired the IARC committee specifically on glyphosate?

A. I came to know that, yes.

Q. And, in fact, from my understanding, you've actually had conversation with Dr. Blair about his work

10:12:16 with IARC and glyphosate?

A. Yes.

Q. Okay. Now, after the sub-committee, you went to work for the National Academy of Sciences; is that right?

A. Correct.

10:12:24 Q. And what was your position or post there?

A. I was the executive director of a newly formed major operating unit of the National Academy of Sciences called the board on agriculture.

Q. And did you -- what was your job? What were you

10:12:40 doing?

A. Well, the National Academy of Sciences at the time wanted to substantially increase its involvement in a wide range of agricultural science and technology and policy issues, and so they elevated to, sort of, major

10:13:01 unit status. They brought in a highly-respected wonderful man named Dr. William Brown to be chair of the board. They hired new staff. I was the new staff director. I had two other staff. And our charge was to go out and design studies, find either federal agencies

10:13:23 or foundations that would support -- financially support the studies, because the National Academy of Sciences, it's not part of government. It was established by an executive order by President Lincoln to provide independent science advice to the federal government.

10:13:39 It's not part of the federal government.

So we did work on -- a lot of work on pesticides, a lot of work on animal drugs, a lot of work on nutrition. We did work on groundwater contamination with pesticides and a lot of work on emerging new techniques for plant breeding.

Q. You were at the National Academy of Sciences as an executive director for about ten years; is that right?

A. Seven.

Q. Seven. Okay.

A. Yeah.

Q. And during your time there, did you help design, recruit, create studies specifically looking at the health effects of pesticides?

A. Yes. We had held -- back when I was the executive director of -- the staff director of the sub-committee, we had done a series of hearings -- oversight hearings on EPA, and one of the biggest issues was how EPA was dealing with oncogenic pesticides in terms of establishing tolerances and approving registrations.

And it was really our sub-committee work that brought fully into the public light and in front of the Congress a fundamental conflict in the two major federal statutes that govern pesticide regulation, FIFRA statute and the Food Drug and Cosmetic Act. There's provisions

in both of them that EPA had to administer, and for certain cases, certain pesticides, certain foods, the FIFRA statute said, "Jump to the right," and the FDCA, the Food Drug and Cosmetic Act, said, "Jump to the left." And EPA was just caught in a -- in an unforeseen conflict between two federal statutes.

10:15:19

So during my time at the sub-committee, we fully brought that out. The EPA people explained the conflict, and I was recruited into this job. I loved my work with the sub-committee. I would have stayed there perhaps for my whole career, but I was given an opportunity to go work for the academy and a substantial pay raise, and all that stuff, so I took the job.

10:15:38

But I almost immediately called up my -- you know, the EPA official that we worked with very closely, a guy named Dr. John Moore, Dr. Jack Moore, and said, "Why don't you have us and the board on agriculture do a National Academy of Science study on this problem you have dealing with oncogenic pesticides and residues in food?" And the EPA thought that was a good idea. We got a large contract, and we did what's called the Delaney Paradox Report.

10:15:54

10:16:13

Q. Okay. Doctor, there's a lot of detail here. We don't need to get into all of it.

A. I'm sorry.

10:16:30

Q. I understand you've got a lot of story to tell. And that's fine, but let's just keep it to the questions --

A. Okay.

10:16:35 Q. -- and we can get through it pretty quickly.

We're trying to get the jury out of here pretty fast.

So -- all right. So after you left the Academy of Sciences, you started a company called Benbrook

10:16:44 Consulting; is that right?

A. Correct.

Q. And as part of the consulting, you would consult with various companies, agencies, government, whoever, about looking at the effects of pesticides and other

10:16:56 things on agricultural practices?

A. Correct.

Q. Okay. I understand at one point you worked for Organics Organization? Is that what it's called?

A. Well, much later. The Organic Trade Association

10:17:05 and then a research-based group called The Organic Center.

Q. And what did you do while you were there?

A. I served as the chief scientist for The Organic Center from 2005, 2006 to 2015. And I was responsible

10:17:21 for tracking scientific developments on the impacted of

organic farming on the nutritional quality of food, the safety of food, both from a perspective of pesticides, antibiotics and antibiotic-resistant bacteria in animal products and the environmental footprint, if you will, of agriculture.

10:17:43

Q. And I understand also as part of your consulting work that you've worked on various scientific studies to examine the effects of pesticides on health; is that right?

10:17:53

A. Oh, many. My very first client was Kraft Foods that was worried about pesticide residues in Folgers Coffee coming out of Central America. That was my very first project as Benbrook Consulting Services, but then I -- because of my involvement with oncogenic pesticides in food and the federal law dealing with it, I had multiple contracts with many people, and my biggest client in that era was a consumers' union, the organization that puts out the magazine Consumer Reports.

10:18:17

Q. And, Doctor, I understand you, in your consulting and capacity, you've actually specifically researched glyphosate and its rise and change of use in the United States?

10:18:27

A. Certainly later on. I started it -- really more extensive work on glyphosate in around 2000 when the use of Roundup, herbicides and other glyphosate-based

10:18:49

herbicides -- and let me just say for the jury --

Q. Doctor, we're going to get into this later.

A. I just want to clear up -- I'll use the term "glyphosate-based herbicides," and that means any herbicide manufactured by any company that contains glyphosate as the active ingredient, so that's the term I will use.

Q. And Roundup, Ranger Pro, those would be glyphosate --

10:19:12 A. Glyphosate-based herbicides.

Q. Okay. All right. So then in 2000 -- so you've done some research on glyphosate specifically. You've been published in peer-reviewed journals; is that correct?

10:19:24 A. Yes.

Q. Specifically relating to the safety of pesticides; is that right?

A. Yes.

Q. You said you started studying it in 2000; is

10:19:34 that right?

A. Yes.

Q. And at what point were you contacted and asked to be looking at the -- glyphosate and its relationship to NHL in a litigation capacity?

10:19:44 A. Would have been September of 2016.

Q. Okay. So you were looking at glyphosate and studying its effect on the world for about 16 years before you were ever contacted by anybody?

A. Oh, yes. Yeah.

10:19:59 Q. Okay. And I understand that you're currently -- I mean, as we speak, you're leading a scientific study in the midwest; is that right?

A. Well, I'm one of the members of the science team, and I have a -- some managerial and operational

10:20:15 responsibilities for a project that's run by the Children's Environmental Health Network. It's a Washington, DC-based organization that works on policy and science issues that effect children's health.

And there's great concern, particularly in the

10:20:31 midwest, about the substantial increase in herbicide use that's happening now and has been going on for a few years, and the potential for that really massive increase in herbicide use to increase the frequency and severity of the number of birth defects and reproductive problems,

10:20:54 and so we've put together a scientific team to address that, and that's ongoing.

Q. Okay. As part of reaching your opinions in this case, have you personally reviewed all the publicly available scientific literature related to glyphosate and

10:21:10 NHL?

A. Well, I've certainly reviewed a lot of it. I would suspect there's a study or two out there that I haven't reviewed.

Q. And in part of your work, you prepared, like, a 250-page report; is that right?

10:21:23

A. My expert report for this case was 207 pages.

Q. Okay. Now, Doctor, we are not going to get into all the stuff in that report. This jury has heard a lot from a lot of experts about studies and mice and epi and exposure, so we're not going to talk about any of that. Okay? What I want to focus on is basically cleanup. I want to talk about a few issues that have arisen during trial and see if we can help explain some of those issues. Okay, Doctor?

10:21:41

10:21:54

A. That's fine.

MR. WISNER: Your Honor, at this time, I would like to certify Dr. Benbrook as an expert in pesticide regulation and pesticide risk assessment.

THE COURT: Any *voir dire*?

10:22:04

MR. GRIFFIS: No, your Honor.

THE COURT: All right. I will accept Dr. Benbrook as an expert in pesticide regulation and pesticide risk assessment. Thank you.

Q. BY MR. WISNER: All right. Let's start off just generally. We've heard a lot about the EPA. Let's just

10:22:16

talk about the general framework of the EPA regulatory decision making process. Okay? And let's talk about this in the context of, like, how a bill -- did you ever seen that thing how a bill becomes a law?

10:22:36 A. Yes.

Q. So let's talk about how a chemical becomes a pesticide. All right. So a company goes out and finds this chemical and goes, "Hey, we can use this as a pesticide." What do they do? What's the steps that

10:22:46 happen before it can get approved for sale in the United States?

A. The EPA has issued extensive guidelines for a set of toxicological studies, environmental fate studies, that are -- that produce information essential to doing a

10:23:07 risk assessment on the -- on the proposed use of the pesticide.

So when a company discovers a molecule that has activity, and that means the potential to control a pest, and so we'll talk about herbicides and weeds in general,

10:23:23 since that's the focus of the case.

So when a pesticide company finds an active molecule, they'll do a number of tests, usually in greenhouses, to figure out which weeds it controls and how much you have to spray. And then they have to do

10:23:40 significant work to understand the environmental fate of

it. Is it -- is it persistent? What level of residue might be in the harvested part of the crop.

And so the company has to develop a set of data that will cover -- and provide EPA the ability to, first of all, understand the potential toxicological hazards associated with exposure to the active ingredients, as well as on how much of it people might be exposed to, from the food that's been treated with it, from drinking water or Coca-Cola or beer, or if it's a farmer that's spraying it or a person that's spraying it around the yard, they need information to calculate what's called occupational exposure.

And all that information goes into the EPA, and in the -- so the pesticide regulation is done by the Office of Pesticide Programs, and that office is broken up into various science divisions that are responsible for the review of different categories of studies.

So the basic science branches get their set of studies, and they have to determine did the research that the -- the registrant that's asking for approval of a pesticide label, does it meet the requirements? And if they check that box, then the -- the -- either the petition to establish a tolerance or an application for a registration, which would be to get a label that would make it legal to sell the pesticide, kind of moves along

the process.

Q. All right. So you said a lot of things there. Let's, kind of, break it down a little bit.

So my understanding is before they can even sell a product, they have to do all this testing on it; is that right?

A. Correct.

Q. Okay. And so they test a lot of things. They test, like, eye irritation, skin irritation, you know, does it -- how it changes in the environment, things like that; right?

A. Correct.

Q. And as part of these battery of different tests, only a small subset of it is directed towards the issue of carcinogenicity; is that right?

A. Correct.

Q. Now, you mentioned occupational exposure. And if a product hasn't been sold on the market yet, how can you have occupational exposure data if it's not being used?

A. Well, the testing guidelines require the registrant to do some field tests under the provisions on the label governing how someone will use it that buys the product. And so they would have to do a study, for example, to estimate dermal absorption or how much would

get on an applicator, or how much would be in food.

So they -- they -- there's a set of studies that go into risk assessment methodologies that the EPA uses, and the EPA will establish some benchmark or exposure threshold over which they don't want to see exposures going above, and they draw on these studies that have been done to make a determination whether their level of concern is exceeded or not.

Q. Well, it seems like this would be a pretty easy system to gain, Doctor. I mean, couldn't I just do 20 studies, even if 19 of them show problems, just don't share that with the EPA? Just give them the one good one? Wouldn't that be a problem? Or is there a way that the EPA tries to deal with that?

A. Well, there is. There's a way that Congress tried to deal with it, and the EPA has to administer the law. Pesticide registrants have an ongoing responsibility to share with the EPA any new information that they get, any studies that they do that raises new information that is not already included in previous studies that have been submitted to the EPA. So it's kind of, "If you learn something new that might suggest a higher risk, you've got to tell us about it."

Q. So, for example, this is hypothetical, if a company had done, like, an exposure study and it showed a

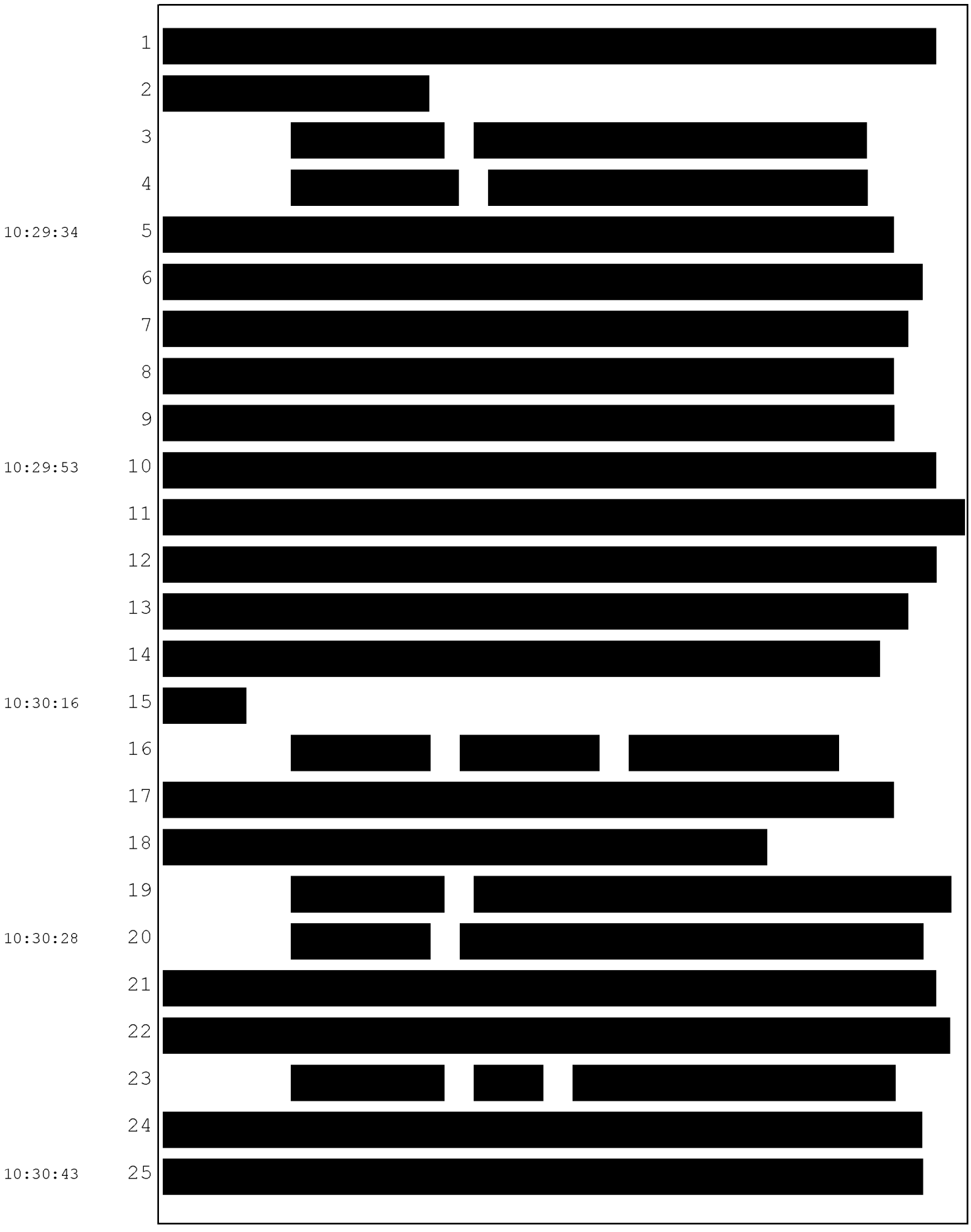
much higher rate of absorption --

MR. GRIFFIS: May we approach, your Honor?

THE COURT: Yes.

(Sidebar.)

[redacted]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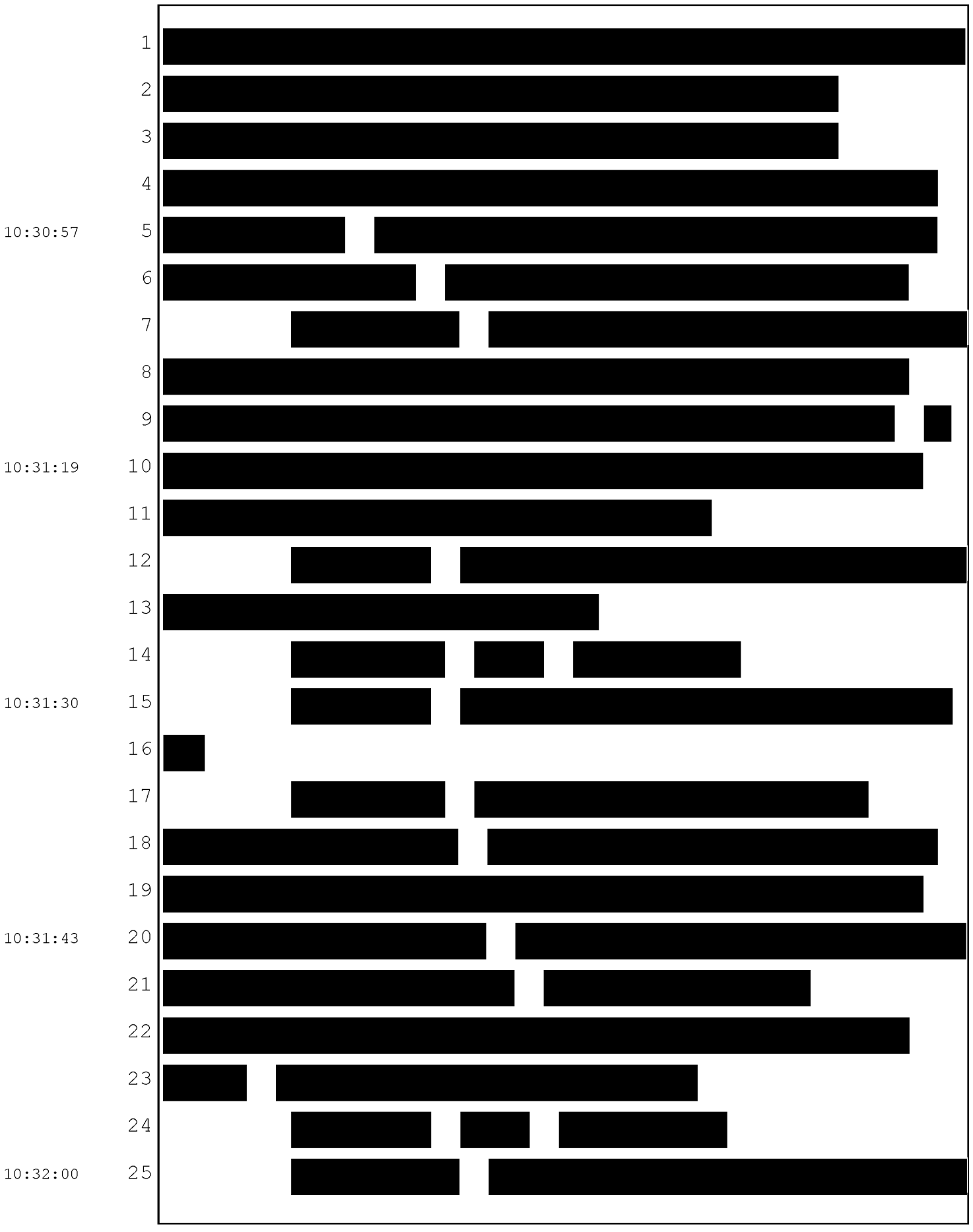
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(End sidebar.)

THE COURT: You may proceed, Mr. Dickens.

MR. WISNER: Wisner, your Honor.

10:32:14 THE COURT: Oh, I'm sorry. Mr. Wisner.

MR. DICKENS: Wishful thinking.

Q. BY MR. WISNER: Doctor, so, hypothetically, if a study had been done that showed dermal absorption over, like, much higher than what had been previously reported, 10:32:28 would that be something that constitutes new information?

A. Yes.

Q. And should be disclosed?

A. Yes.

Q. Okay. And I guess that applies similarly to -- 10:32:36 you said new information. Could it also be evaluation of old information with a new conclusion?

A. Yes.

MR. GRIFFIS: And, your Honor, same -- same objection.

10:32:46 THE COURT: All right. Overruled.

But be careful, please, Mr. Wisner.

MR. WISNER: Yes, your Honor.

Q. Okay. We've had some discussion in this court about the Roundup and Ranger Pro labels. I just want 10:33:02 to -- who controls that label?

A. The registrant, Monsanto Company.

Q. And putting aside Monsanto, let's talk about general EPA regs. I shouldn't have gone to Monsanto. Let's just keep it general.

10:33:17 Is -- who has the responsibility for the accuracy of the label?

A. The registrant that drafts the label and submits it to the EPA for review and approval.

Q. And can a registrant, if they discover new

10:33:32 information, change the label?

A. Oh, absolutely. They do it almost on an annual basis.

Q. In fact, they're required to; right?

A. Yes.

10:33:41 Q. And, Doctor, in your entire career monitoring EPA and pesticide use, have you ever seen in your entire life the EPA reject a label --

MR. GRIFFIS: Objection. Your Honor.

MR. WISNER: Let me finish my question.

10:33:57 Q. -- where they tried to add risk information?

A. No.

MR. WISNER: Oh, sorry. Don't answer.

MR. GRIFFIS: That's a violation of Restriction 4 on the order.

10:34:06 THE COURT: All right. Sustained.

Please ask a different question.

MR. GRIFFIS: May I ask that the question and answer be stricken?

THE COURT: Yes. The question and answer will be stricken.

Now, Ladies and Gentlemen, you should disregard that last question and answer.

Q. BY MR. WISNER: Now, I understand that EPA requires certain types of studies; is that right?

10:34:28 A. Yes.

Q. I want to ask a different question. Does the EPA prevent any studies?

A. No. Not -- I mean, you can't -- you can't administer a pesticide to a pregnant woman to see its

10:34:49 effect on her developing child. I'm sure that's illegal.

Q. Okay. Fair enough.

Let me ask you a more specific question. Does the EPA prevent a company from conducting an epidemiological study?

10:35:02 A. No.

Q. Does the EPA prevent a company from studying whether a formulated product can cause cancer?

A. No.

Q. So if someone were to say, "Well, the EPA

10:35:13 doesn't require it," that doesn't mean the EPA prevents

it; is that right?

A. Oh, yes, of course.

Q. Now, there's been some discussion about the regulations surrounding surfactants in this case. What is a surfactant, Doctor?

A. A surfactant is a so-called inert ingredient. And inert because it doesn't contribute to the weed control impact of the formulated product. Glyphosate is a pure active ingredient. No one ever buys, no one ever applies pure glyphosate. They buy a formulated product that has surfactants added to it which alter the environmental fate of the herbicide when it's applied in the environment.

The key thing for surfactants is to get the Roundup to stick to the surface of the weed long enough to get inside the weed where it will have its desired impact on it, i.e., kill it. And the big concern is, you know, it rains sometimes, so the surfactants help keep the Roundup on the weeds long enough to get inside even if there's a little bit of rain.

Q. And now, Doctor, do you know the word "synergy"?

A. Yes.

Q. What does that mean?

A. Synergy is a concept when one thing potentiates or increases or enhances another thing, and in the field

of pesticide risk assessment, it's a very important concept that arise in the review of a majority of pesticides, because of the potential for a pesticide active ingredient to interact with the surfactants that it's formulated with or to interact with the fertilizers that are in the tank. Lots of times farmers will put liquid fertilizer in a tank and some herbicide and make one application across the field. So they have to worry about do the chemical properties of the fertilizer affect the environmental fate of the pesticide, maybe making it more likely to leach into groundwater or more persistent.

Q. Now, I understand that the EPA, they require animal cancer studies about glyphosate; right?

A. Correct.

Q. And I understand that they have studied in computer models the carcinogenicity of the surfactant; is that right?

A. EPA, in assessing the potential cancer risks from various surfactants, they rarely require a battery of two-year cancer studies like -- like has been done on most major active ingredients. But what they do is they look at structure activity relationships from -- you know, basically is this: Is the structure, the chemical structure of the surfactant, is it similar to some other chemical that we know poses some oncogenic risk. And if

there isn't anything, they don't require any further testing.

Q. Now we talked about synergy. Does the EPA require tests to measure the synergy between a pesticide and its other ingredients?

10:38:39

A. Not very often, no. Certainly not -- certainly not routinely.

Q. Let me just ask you this question: To the best of your knowledge, has anybody ever attempted to study the formulated product of glyphosate and its surfactants on the animal carcinogenicity?

10:38:53

A. There's only been -- there's been no formal two-year cancer study, no.

Q. Monsanto's Roundup came on the market in 1976.

A. First experimental use permit was in 1974, and various labels came into place in '75, '76. I think the first Roundup was in -- the first Roundup label was approved in '76.

10:39:14

Q. And my understanding is that when a registrant submits a product for registration on the issue of cancer, they submit usually one mouse and one rat study; is that right?

10:39:34

A. That's what the requirements call for, yes.

Q. Okay.

MR. WISNER: Permission to publish Exhibit 12,

10:39:45

sorry, 1021 and 1020.

THE COURT: Any objection?

MR. GRIFFIS: I don't think so. I'm not quite sure what they are.

10:40:19 No objection.

THE COURT: Very well. You may proceed.

Q. BY MR. WISNER: Now, Doctor, I don't want to spend too much time on this. Dr. Portier walked us through a lot of tumors and stuff. But I just want to

10:40:32 ask a question about something because it occurred to me this might be something that the jury is wondering.

We just established that Roundup was approved in 1974, '76; right?

A. Correct.

10:40:41 Q. Yet this mouse study is 1983. Do you see that?

A. Yes, sir.

Q. And this rat study is 1981. Do you see that?

A. Yes.

Q. Okay. Is it fair to say that between its

10:40:58 original registration in the '70s in these mouse and rat studies, there actually was no valid mouse or rat studies related to the carcinogenicity of this product?

MR. GRIFFIS: Objection, your Honor --

THE COURT: Sustained. Please ask a different

10:41:15 question.

MR. WISNER: Okay. Your Honor, can I have a sidebar?

THE COURT: Yes.

(Sidebar.)

(End sidebar.)

THE COURT: You may continue.

Q. BY MR. WISNER: Sir, you studied, looked at all the animal studies conducted on Roundup -- and sorry, specifically glyphosate; right?

10:42:55

A. Yes.

Q. All the ones that were on these boards; right?

A. Yes.

Q. You looked at them closely; right?

10:43:01

A. Yes, in varying degrees of depth, but yes.

Q. And you've even looked at the studies that happened before these ones; right?

A. Yes.

Q. Okay.

10:43:13

MR. WISNER: Your Honor, may I ask the question now or no? Has the foundation been laid?

THE COURT: No. You may ask a different question.

Q. BY MR. WISNER: Let me ask you this: Before

10:43:35

these dates, to the best of your knowledge, Doctor, were there any valid studies on animal carcinogenicity?

MR. GRIFFIS: Objection. Ask counsel to move on.

THE COURT: Objection is sustained.

10:43:46

MR. WISNER: Okay.

Q. Let's talk about one of the ones on this board. Talk briefly about the 1983 study.

Do you see that?

A. Yes, sir.

10:43:58 Q. This is one by Knezevich & Hogan; is that right?

A. Correct.

Q. And I understand that this study is specifically addressed in the IARC Monograph; is that right?

A. That's correct.

10:44:10 MR. WISNER: Your Honor, permission to publish the IARC Monograph, which is Exhibit 169.

THE COURT: Very well.

Q. BY MR. WISNER: Doctor, our cool computer system that we have crashed this morning.

10:44:24 A. Well, what do you know. And in San Francisco to boot.

Q. I know; right? Why we don't have a backup, I don't know, Brian. But we're going to do it old school.

All right. So this is a copy -- all right.

10:44:55 This is a copy of the Monograph, and it has some highlights on it. I apologize. But this is a copy of the Monograph; right?

A. Yes, correct.

Q. And this is Exhibit 169. Do you see that?

10:45:07 A. Yes.

Q. Now in the Monograph there's a discussion about this, and I just want to sort of walk through it a little bit so the jury can understand it when they're reviewing this later.

10:45:18 So this is on page 30, and this is the section cancer in experimental animals.

Do you see that, Doctor?

A. Yes.

Q. And the first one is table 3.1, and it says

10:45:32 dietary administration?

A. Correct.

Q. And it proceeds to describe a group of studies, groups of 50 male mice and 50 females, CD-1 mice.

Do you see that?

10:45:43 A. Yes, sir.

Q. This is the study of the Knezevich & Hogan; is that right?

A. Yes. I refer to it in my expert report as the 1983 biodynamics study. That's the contract lab that

10:45:53 conducted it. But it's also known by the two authors.

Q. Okay. And there's quite a bit of discussion of this study in the Working Group, and let's just read some of it. It says there was a consistent -- okay, starting here.

10:46:08 There was a positive -- I need a highlighter.

All right. It says, "There was a positive trend test in the incidence of renal tubular adenoma in dosed male mice.

Do you see that?

10:46:25 A. Yes, sir.

Q. Okay. Very simply, what does that mean?

A. It means that in this study, the groups of mice, male mice that were treated with Roundup, had a statistically significant increase in cancer.

10:46:43 Q. Okay. Then it goes, "The Working Group noted that the renal tubular adenoma is a rare tumor in CD-1 mouse."

Do you see that?

A. Yes.

10:46:52 Q. And do you agree with that?

A. Well, yes.

Q. "No data on tumors of the kidney were provided for female mice. No other tumor sites were identified."

Do you see that?

10:47:03 A. Yes.

Q. And it cites the EPA's 1985. Do you see that?

A. Yes.

Q. That's referring to an EPA report that was generated in 1985 related to this study?

10:47:13 A. Very well-known report, yes.

Q. Subsequent to its initial report, the United States Environmental Protection Agency recommended that additional renal sections be cut and evaluated from all male mice in the control and treated groups. The pathology report for these additional sections indicated the same incidence of renal tubular adenoma as originally reported, with no significant increase in incidence between the control group and treated groups by pairwise comparison. However, as already reported above, the test for linear trend in proportions resulted in a significance of point -- a P value of .016.

Do you see that?

A. Yeah, that was the evaluation of the Working Group of this 1983 biodynamic study, the renal tubular adenomas in the male mice, yeah.

Q. To say this really simply, they looked at it, they saw an increased risk; is that right?

A. Yes.

Q. The EPA? Then they again had a group reevaluate those tumors; right?

A. Yes.

Q. And they still saw the results?

A. Yes.

Q. Sorry, there's a lot of complicated verbiage to explain a simple thing, but it's how it's written.

"The EPA also requested that a pathology Working Group be convened to evaluate the tumors of the kidney observed in male mice treated with glyphosate, including the additional renal sections."

10:48:44 Do you see that?

A. Yeah.

Q. Now, you reviewed the EPA documents at this time; right?

A. Yeah, I've been -- I've carefully studied and 10:48:51 referred to this back and forth between EPA and the registrant on this particular study for, you know, 20 years.

Q. And you've been studying the EPA. Have you ever seen the EPA conduct a pathology Working Group after they 10:49:05 find a positive result?

A. It's a fairly unusual event, but you know, this was a -- this was a cancer study and a controversy that had enormous consequences.

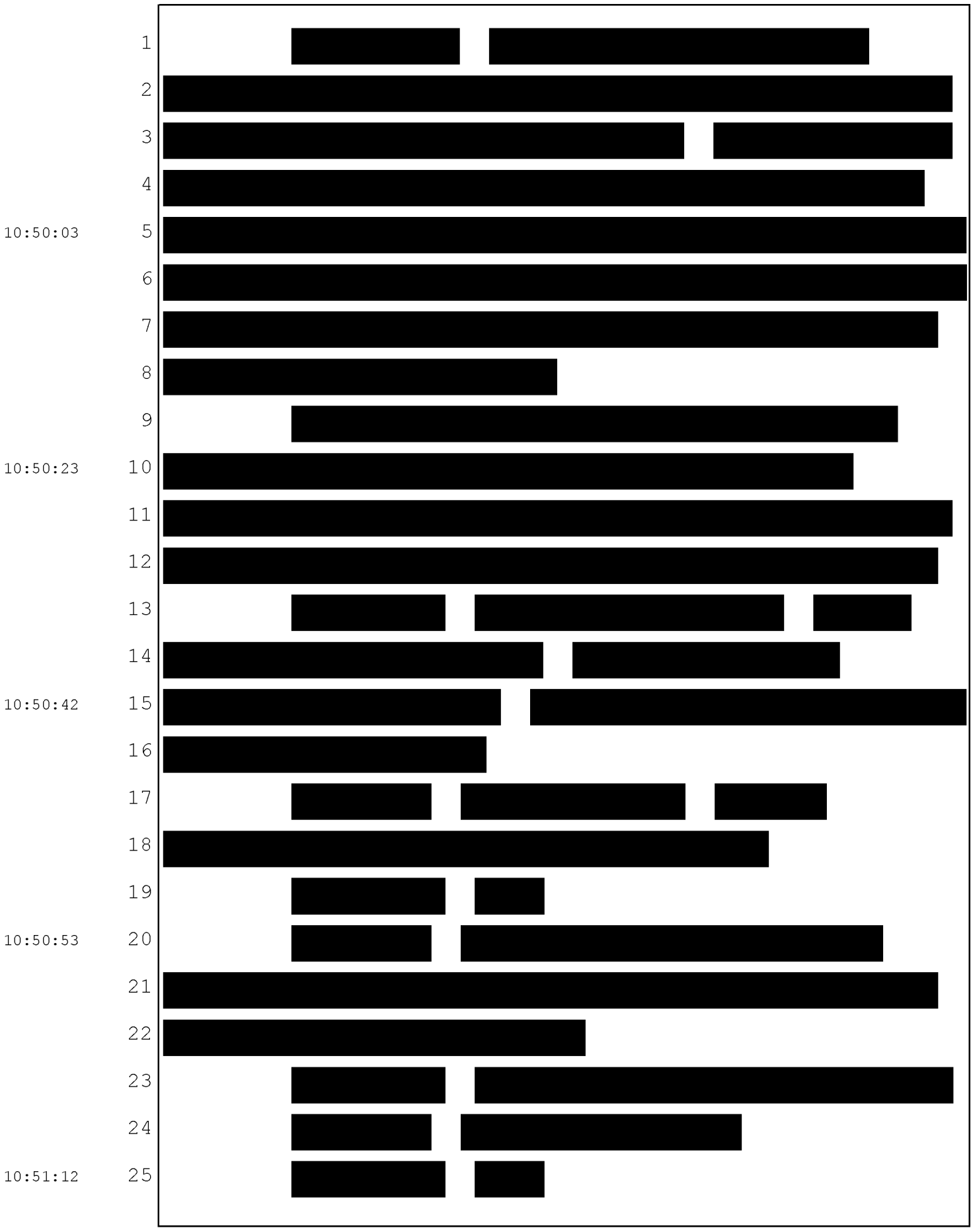
Q. And do you know if that was done at the request 10:49:22 of Monsanto?

A. Well, I'm -- I don't -- I think Monsanto continued to press its case with the agency.

MR. GRIFFIS: Your Honor, may we approach?

THE COURT: Yes.

10:49:48 (Sidebar.)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(End sidebar.)

THE COURT: All right. You may proceed, Mr. Wisner.

MR. WISNER: Thank you, your Honor.

Q. So at this time, it's your understanding that Monsanto requested that the EPA take another look at the data?

A. Yes.

Q. In the second evaluation, the -- I guess this is the pathology Working Group, reported that the incidence of adenoma of the renal tumors was 1 out of 49 and that it was not statistically significant.

Do you see that?

A. Yes.

Q. What changed between the first evaluation and the second one, just factually?

A. Factually, a new group of pathologists was hired by Monsanto to look at the slides, and first one and then

several others identified an additional renal tubular adenoma in control mouse number 102A, which just for the jury's sake, this may be the most debated tumor in the history of carcinogenicity testing. I'm serious. It's been looked at and looked at and looked at.

10:52:41

MR. GRIFFIS: Objection, your Honor, interpretation and commentary.

MR. WISNER: It's not prejudicial. It's true.

THE COURT: Objection is sustained.

10:52:50

MR. WISNER: Okay.

Q. Let's just refrain from any commentary. Stick to the facts.

A. I'm sorry.

Q. So just walk through here, EPA looks at it, sees no tumor in the control group?

10:53:02

A. Correct.

Q. EPA looks at it again, sees no tumor in the control group; correct?

A. Correct.

10:53:10

Q. Monsanto takes a look at it and they find a tumor in the control group?

A. Correct.

Q. And that tumor in the control group suddenly makes the result no longer statistically significant?

10:53:20

A. Or equivocal.

Q. Okay, fair enough. Equivocal.

And then it goes on to say, "The incidence of carcinoma of the renal tumors was," and it gives the numbers, and it gives a P value of .037.

10:53:34 Do you see that?

A. Yes, sir.

Q. So even after this new Working Group review and they find this tumor in the control, the review of actual cancer was still statistically significant?

10:53:45 A. Correct, according to the Working Group, yes.

Q. Okay. All right. And it gives a bunch of numbers. I don't want to spend too much time on it. It says, "The Working Group considered that this second evaluation indicated a significant increase in the

10:54:02 incidence of rare tumors with a dose-related trend which could be attributed to glyphosate."

Do you see that?

A. Yes.

Q. All right. And it goes on for a bunch more

10:54:12 stuff. I don't want to belabor the point, but at least according to IARC, even after they found this tumor, they still considered it to be significant; is that right?

A. Correct.

Q. Okay. After this tumor was found -- we're going

10:54:31 to come back to the Monograph later, Doctor, but after

the tumor was found, did the EPA request a scientific advisory committee?

A. You're talking about the additional tumor in the control mouse?

10:54:44 Q. Yeah, in 1985.

A. Yes, there was. Yes.

Q. And in 1985, they convened a scientific advisory panel. They've heard about what that is so we don't have to explain that.

10:54:57 A. All right.

Q. And at the meeting different positions were presented by Monsanto and by the EPA; right?

A. Correct.

Q. About how to interpret this data; right?

10:55:05 A. Correct.

Q. And then the SAP, after that meeting, made a recommendation; right?

A. Yes, they did.

Q. And the recommendation was we don't know what's

10:55:13 going on here. It's not very clear. Let's do the study again; right?

A. They used the term "equivocal," and they recommended that EPA call in, which is a term of art, which means request a registrant to do another study, a

10:55:33 replacement mouse oncogenicity study.

Q. And the EPA said, okay, we'll do that?

A. Correct.

Q. And they requested the study. And did they make any special accommodations for the study?

10:55:48 A. Yes, they did.

Q. What did they do?

A. Because of the guidance provided in the scientific advisory panel meeting, it was very clear that the issue was this, really these renal tubular adenomas

10:56:05 in the male mice.

And so EPA and -- actually in consultation with Monsanto, designed kind of a renal tubular adenoma study on steroids, where they increased the number of animals per treatment group from 50 to 200. They added two

10:56:25 additional dose ranges to more clearly delineate the dose-response relationship, and they said don't have to do the females, just do it in the males.

And they also -- because Monsanto was concerned about the cost of the study, they said you only have to

10:56:42 do a histopathology on the liver and the kidney, and if those turn out clean, you're done, the study's done.

Q. Let's break that down. Normally in a mouse or rat study, they do these treatment groups, both sexes, and they look at every possible organ to see if there's tumors; right?

A. They look at a lot of different things, yes.

Q. But here they're saying, listen, don't worry about all that extra work. Just look at the kidney and liver and see if you see any tumors there in male mice?

10:57:09 A. And in particular, the renal tubular adenomas that they were concerned about.

MR. WISNER: Permission to publish again, 1020?

MR. GRIFFIS: No objection.

THE COURT: All right.

10:57:21 Q. BY MR. WISNER: So sir, the studies here is 1983. That's the one we're talking about; right?

A. Correct.

Q. That was already done.

This Atkinson study, is that the one that was

10:57:31 done?

A. No.

Q. Was that study that was requested by the EPA ever done?

A. No.

10:57:42 Q. All right. Let's talk about a few other issues. Since we're back in cleanup, I'm going to be kind of jumping around here, and I apologize, Doctor.

Let me ask you a question: Are you familiar with the word "ghostwriting"?

10:57:52 A. Yes, sir.

Q. What is "ghostwriting"?

A. Ghostwriting is a term of art that's applied in the scientific literature but also in popular literature, where the individuals that wrote or contributed to a document are not given attribution in the list of authors or author of a document.

Q. And when you say "attribution," do you mean they don't disclose that they wrote it?

A. Correct.

Q. Okay. And in the world of scientific assessment, which is where you operate, is ghostwriting considered ethical?

A. Oh, heavens, no.

Q. Why not?

A. Because it's very important for people reading the scientific literature to have knowledge of who conducted the research and interpreted the results and wrote the paper. That's considered very important in evaluating the quality of the research, the reliability of the research, the independence of the research, whether there was a conflict of interest of some sort.

So it's truthfulness in authorship is a central feature of scientific publishing integrity.

Q. Now, Doctor, I want to be clear: I understand you published an article in 2017 about glyphosate; right?

A. Yes.

Q. But it was actually submitted months, months before the journal; right?

A. Yes.

10:59:27 Q. And your portion of it, your research on it, was done before you were ever involved in litigation in this case; right?

A. Yes. That paper, yeah.

Q. So when it got submitted, it didn't have any

10:59:39 disclosure about you working on glyphosate litigation?

A. Correct.

Q. But subsequently, you did start working for -- at least in the context here today?

A. Yeah, correct.

10:59:50 Q. And so that paper exists out there in the world, and it doesn't say that you were an expert for us, does it?

A. No.

Q. Are you working to correct that?

10:59:59 A. Well, if it's required by the journal, yes.

Q. And Doctor, to be clear, you have published after that as well; right?

A. Yes, several papers.

Q. And you've published, you know, after you've

11:00:10 been hired as an expert in this case; right?

A. Correct.

Q. And have you disclosed that you're an expert in those?

A. In papers that address anything involving pesticides, yes.

11:00:19

Q. Thank you.

Now, we're jumping around here. I know it's a little awkward, but we're just cleaning up some stuff.

So what is a abstract in a journal?

11:00:34

A. An abstract is a very important part of a paper. It's a concise summary of the purpose of the research, the methodology used, the statistical analysis done on the results, the key findings from the study, the new information that a piece of research is reporting to the

11:00:56

rest of the silicone community, and then often there's a conclusion section.

The abstract is very important because in all of the search engines that scientists use to try to learn what other scientists have done on a particular topic,

11:01:11

the -- they focus on the title of the paper and the words that in the abstract.

So it's a -- the abstract is a very essential tool for communicating with the rest the scientific community and anybody that uses the published scientific

11:01:27

papers.

Q. You're familiar with PubMed; right?
A. Pardon me?
Q. PubMed?
A. Yes, of course.
11:01:31 Q. That's a search engine for scientific literature; right?
A. PubMed is the Federal government's major biomedical search engine, yes.
Q. And so if you type in a search on like, you
11:01:43 know, pesticides in cancer, it would hopefully give you most of the publications that related to pesticides in cancer; right?
A. Yes, an awful lot of them.
Q. Okay. And very often you'll click on a link --
11:01:53 I'm saying this because I've done this before, but you click on a link and you often go to a page that has the abstract; right?
A. Correct.
Q. But to get the full article, you sometimes have
11:02:03 to pay for it; right?
A. Yes. Yes, absolutely.
Q. And sometimes they're free, but a lot of times they're behind a pay wall; is that right?
A. Correct.
11:02:11 Q. So to read the whole article, you have like pay

30, 40 bucks to see the article --

A. Or subscribe to the journal.

Q. There you go.

And if something is not in the abstract and the person doesn't have a description to that journal, they won't learn about something because it's behind a pay wall; right?

A. They wouldn't be alerted to seek out the full paper if something's not addressed in the abstract.

Q. Now, Doctor, from a scientific perspective, if a journal article raises a new concern about a risk, do you think it would be appropriate to celebrate getting it out of the abstract?

MR. GRIFFIS: Objection, your Honor. Restrictions 1 and 5 from the order regarding Dr. Benbrook.

THE COURT: Sustained.

Please ask a different question.

Q. BY MR. WISNER: Are you familiar with the American Council on Science and Health?

A. Yes.

Q. What is that?

A. It's a private organization funded primarily by drug, food, pesticide companies that issues reports on regulatory issues, risk assessment issues, that argue

largely from the perspective of the industry.

Q. The ACSH, what position did it take with regards to tobacco?

A. They were one of the scientific organizations that held out to the end and argued that the science really wasn't clear about tobacco causing cancer.

11:03:41

Q. Talked about how too many confounding factors; right?

A. That's certainly one of the arguments that that's brought up.

11:03:54

Q. The ACSH, they also took a position with regard to lead poisoning; is that right?

A. They were one of the organizations active in that debate, too, yes.

Q. The jury has heard some testimony about them through Dr. Goldstein's deposition so I'm not going to get into it too much. But are you aware of what position they've taken with regards to glyphosate?

11:04:07

A. Actually, I'm not.

Q. Okay. Now I understand there's reporting requirements under FIFRA; is that right?

11:04:21

A. Yes.

Q. And I understand that there's a time limit for when someone has to report an adverse effect; is that right?

11:04:32

A. Yes. Various time limits.

Q. What are the time limits?

MR. GRIFFIS: Objection, your Honor. We discussed this at sidebar. It's number two.

11:04:40 MR. WISNER: I didn't pose a hypothetical. This is just what the law is.

THE COURT: He may answer this question, but be careful.

MR. WISNER: Yes, your Honor.

11:04:48 THE WITNESS: There's a provision in the Federal pesticide law that places a continuing responsibility or obligation on registrants to submit new information that they become in the possession of to the EPA if that information is in really any way new relative to

11:05:10 conducting a risk assessment of a registered pesticide.

Q. BY MR. WISNER: All right. Again, we're just doing kind of flash issues here. I apologize for that. It's confusing. But let's move on to another issue.

I want to specifically talk about labels and the

11:05:26 Material Safety Data Sheet. This is something that you looked at and considered and reviewed in your professional capacity as well as for this case.

THE COURT: Mr. Wisner, before we get into a new topic, perhaps we should take the morning break.

11:05:38 MR. WISNER: Perfect, your Honor.

THE COURT: All right. Ladies and Gentlemen, we'll be in recess for 15 minutes and resume again at 11:20.

(Recess.)

11:20:46 THE COURT: Welcome back, Ladies and Gentlemen.

Mr. Wisner, do you wish to recall Dr. Benbrook?

MR. WISNER: Yes, your Honor.

He just went to the bathroom.

THE COURT: I think I see him in the back.

11:21:22 MR. WISNER: All right.

THE COURT: Welcome back, Dr. Benbrook.

THE WITNESS: Thank you.

THE COURT: All right. Ladies and Gentlemen, Dr. Benbrook remains under oath.

11:21:38 And Mr. Wisner, when you're ready, you may proceed.

MR. WISNER: Thank you, your Honor.

Q. I'd like to talk to you a little bit about the IARC Monograph. It's something that you relied upon; 11:21:48 right?

A. Yes.

Q. And it's something that you have considered and reviewed as part of, you know, your evaluation of the issues in this case?

11:21:56 A. Correct.

MR. WISNER: All right. Permission to publish Exhibit 166, which is in evidence. It's the preamble to the IARC Monograph.

THE COURT: Very well. You may proceed.

11:22:14 Q. BY MR. WISNER: Doctor, this is Exhibit 166, and this is a copy of the preamble for the Monograph program; is that right?

A. Yes.

Q. Okay. And to the best of your knowledge, this

11:22:24 is the one that was in operation at the time that glyphosate was assessed; right?

A. I believe so, yes.

Q. Okay. It's got a lot of highlights here. I apologize for that. You know what? I think we actually

11:22:41 have a clean one. Give me one sec. Okay.

All right, Doctor, I'm going to talk about the preamble. There's one thing I want to share with you. The jury here has actually heard testimony from Dr. Daniel Goldstein in this case.

11:23:00 A. Okay.

Q. And when he was asked about the IARC Monograph, he said, "They completely failed to take into account any consideration of exposure." And then he goes on to say, "They did not take into account real-world exposure

11:23:16 data."

I want to talk about that. All right?

A. Okay.

Q. Now, in the preamble the sort of source of this issue and debate has been the sentence -- and I'm sorry it's all pink because it's my notes, but it starts at line 18 on page 2 of the preamble.

Can you see it, Doctor?

A. Yeah, I do. I can see it here.

Q. And it reads: "A cancer hazard is an agent that is capable of causing cancer under some circumstances, while a cancer risk is an estimate of the carcinogenic effects expected from exposure to a cancer hazard."

You understand the difference between a hazard and a risk, Doctor?

A. Yes, of course.

Q. Okay. And to the best of your knowledge, doesn't the EPA do both?

A. Yes, they do.

Q. So before they get to a risk assessment, they actually conduct a hazard assessment; is that right?

A. A hazard assessment is a part of a risk assessment, yes.

Q. So to put it simply, you first determine can it cause cancer and then you see at what rate does it cause cancer. Is that a fair way --

A. Based on exposure, yes.

Q. Okay. "The Monographs are an exercise in evaluating cancer hazards despite the historical presence of the word 'risk' in the title. The distinction between hazard and risk is important, and the Monographs identify cancer hazards even when risk are very low at current exposure levels because new issues or unforeseen exposures could engender risks that are significantly higher."

11:24:37 11:24:53

Do you see that?

A. Yes.

Q. It's my understanding -- tell me if this is right -- but IARC can, in fact, determine that a substance is carcinogenic but it's not really causing cancer in the real world. That's possible; right?

11:25:03

A. Well, a good example would be an industrial chemical that's made in a factory. Somebody working inside the factory is exposed in a totally different way than the general public.

Q. So in that context, like industrial chemical, we know it causes cancer, but it's not likely causing cancer in the real world; right?

11:25:13

A. Because of the difference in exposure.

Q. Now just because IARC can do this; right? That they can identify something that's cancer causing, even

11:25:28

not necessarily in the real world, does that mean that they necessarily always do that?

A. I don't understand your question.

Q. It says they may do this; right? They may identify a risk that maybe is not really causing cancer in the real world; right?

A. Yes.

Q. Does that mean that every time they identify a cancer-causing agent, it's not causing cancer in the real world?

A. Heavens, no.

Q. And in fact, with glyphosate did they do one of these cancer hazards but there's no risk?

A. No, they did not.

Q. All right. This issue that they didn't look at any exposure at all in the real world, I'd like to show you some portions of the preamble and ask what they mean. So there's a section in this preamble that's interestingly enough titled "Exposure Data."

Do you see that?

A. Yes.

Q. And it reads -- it has a paragraph sort of outlining the section. It says, "Each Monograph includes general information on the agent." And then it goes, "Also included is information on production and use, when

appropriate, methods of analysis and detection, occurrence, and sources and routes of human occupational and environmental exposures. Depending on the agent, regulations and guidelines for use may be presented."

11:26:46 Do you see that?

A. Yes, sir.

Q. All right. I want to talk specifically about the portion that really is at the heart of this, and this is occurrence and exposure.

11:26:53 Now, what section of the Monograph is this referring to?

A. Well, typically the very first section addresses use and exposure.

Q. In the real world?

11:27:05 A. Yes.

Q. Okay. It goes on, "Information on the occurrence of an agent in the environment is obtained from data derived from the monitoring and surveillance of levels in occupational environments."

11:27:17 What does that mean, "occupational environments"?

A. That means reviewing any information about levels of exposure to people that actually mix and load the pesticide or apply the pesticide or live or work

11:27:34 around an area where the pesticide is applied.

So there's -- for the general public, we could be exposed to pesticides through our food and drinking water, but for other people that live near where they're being used, they could also be exposed either because they handle or use the pesticide or they're in an area where a lot of it's applied.

Q. All right. They also look at air, water, soil, plants, foods, and animal and human tissues.

Do you see that?

A. Yes.

Q. And when they collect all this exposure information, are they collecting this exposure information from out in the real world?

A. Yes. For the most part, yes.

Q. Because water, that's out in the real world; right?

A. Yeah.

Q. Soil, real world?

A. Yes, sir.

Q. All right. "When available data on the generation persistence and bioaccumulation of the agent are also included."

What does "bioaccumulation" mean?

A. It's a very important property of certain pesticides. It's very important in the risk assessment

process because some pesticides actually concentrate as they move up the food chain, from bacteria to a snail to a bird to an eagle.

This is what, of course, was the problem with DDT that threatened the bald eagle. It bioaccumulated in food chains.

So persistent -- certain pesticides that are persistent, the level of them in different parts of the environment can increase.

11:29:03 Q. It goes on to say, "Data that indicate the extent of past and present human exposure, the sources of exposure, the people most likely to be exposed, and the factors that contribute to the exposure are reported."

Do you see that?

11:29:16 A. Yes.

Q. What is that referring to, sir?

A. That's referring to the -- all of the data that an IARC Working Group accesses and reviews that gives them the best possible sense of the levels of exposure

11:29:32 and who's being exposed and through what routes of exposure.

A route of exposure could be inhaled, falls on the skin, in drinking water, or via food. Those are the major routes of exposure.

11:29:47 Q. So when the data is available, the IARC

committee specifically looks for exposure data before rendering a decision?

A. Yes.

Q. Let's look and see what they did for glyphosate, okay?

MR. WISNER: Permission to publish 169, your Honor, the Monograph.

THE COURT: Yes.

Q. BY MR. WISNER: So this is the Monograph; right? Do you see that, sir?

A. Yes, sir.

Q. And this is the first page of it; right?

A. Correct.

Q. And the very first page here, what's the first section?

A. It goes over exposure data and information that provides some concept of the levels of exposure.

Q. And if we go through here, it talks about, you know, production volume; right? Do you see that?

A. Yes.

Q. Agricultural uses. Do you see that?

A. Yes.

Q. And it goes into residential use, other uses. Do you see that?

A. Yes.

Q. And it even talks about the regulation of the various things. Do you see that?

A. Yes.

Q. Now, measuring and analysis, it talks about how it's collected. Do you see that?

A. Correct.

Q. And there's even a table here going through the various ways that it's been collected and studied by the Monograph program; right?

A. Correct. And regulators around the world.

Q. They look in the water, in the soil, dust and air, fruits and vegetables, crops, vegetation, urine.

Do you see that?

A. Yes.

Q. And this is typical for the IARC Monograph. If the data exists on exposure, they're going to look at it; right?

A. They do it in the case of every one.

Q. All right. And it goes down here, occurrence and exposure. Do you see that?

A. Yes.

Q. Occupational exposure, we were just talking about that; right?

A. Yes.

Q. And I notice in here it actually cites -- it

goes Canada -- it mentions a couple studies. And the one I want to ask you about is this one.

Do you see that?

A. Sure.

11:31:35 Q. Do you see -- what is Acquavella 2004?

A. That's Dr. John Acquavella's Farm Family Exposure Study done in Iowa in 2004 -- yeah, published in 2004 in *Environmental Health Perspectives*. It was a Monsanto conducted and financed study. Important

11:31:54 contribution to the literature.

Q. So that's the Farm Family Exposure Study; is that right?

A. Correct.

Q. And is that an epidemiological study?

11:32:08 A. No, no. It was an exposure study. We talk about it now with the word "biomonitoring."

Q. So if I were to state to you Monsanto Has conducted epidemiological studies on glyphosate-containing formulations, including the Farm

11:32:32 Family Exposure Study, that would be a true statement?

A. No, it wouldn't. Not all of it.

Q. The Farm Family Exposure Study, that's just not an epidemiological study?

A. Right, it's not a -- yeah. And it didn't claim

11:32:47 to be, either.

Q. All right. So it looks like IARC is specifically -- oh, who paid for that study?

A. Monsanto.

Q. So the IARC Monograph is actually looking at exposure as reported by Monsanto's own studies; is that correct?

A. In a peer-reviewed published journal, yes.

Q. And it goes on. It looks at community exposure. Do you see that?

A. Yes.

Q. And it talks about how it can be found in these different areas of the soil and water and groundwater and stuff?

A. Correct.

Q. And then there's actually -- it goes into charts about the different data that they have and where it's cited to here in reference.

Do you see that, Doctor?

A. Yes, sir.

Q. It goes on. And then they talk again about air. You see that?

A. Yes.

Q. Water; right?

A. Yep.

Q. It talks about how it could be in food, maybe?

A. Correct.

Q. And this is household exposure. Do you see that?

A. Correct.

11:33:40 Q. And this is actually they're talking about a study done on California households?

A. I believe that's the case, yes.

Q. It talks about biological markers; right?

A. Correct.

11:33:51 Q. To see if -- it says right here, "Glyphosate concentrations in urine were analyzed in urban populations in Europe and in rural populations living near areas sprayed for drug eradication in Columbia."

You see that?

11:34:06 A. Correct.

Q. Glyphosate concentrations in Columbia were considerably higher than in Europe with a means of -- some numbers that I don't pretend to know.

Do you see that?

11:34:17 A. Yes, sir.

Q. And to be clear, this is referring to a study that people were being sprayed in Columbia and they were looking to see how much glyphosate was absorbed; right?

A. Well, the people weren't being sprayed. They

11:34:30 were spraying from large planes areas where coca, the

sources of heroin and cocaine, was being grown in Columbia, and people lived in those areas and farmed, and they were -- they were exposed from some of that aerially applied herbicide.

11:34:44 Q. And they wanted to see if any of it was absorbed and they said it was. It was absorbed in their urine at least; right?

A. Correct, there was a considerable amount of science done on those exposed populations.

11:34:56 Q. There's even an exposure assessment. Do you see that?

A. Yes.

Q. It says it's discussed specifically, a similar assessment on epidemiological studies on glyphosate and

11:35:07 cancer are discussed in section 2.0 of the Monograph on malathion in the present volume.

Do you see that?

A. Yes.

Q. Can you explain what it means by the volume?

11:35:14 What's that referring to?

A. The Working Group's full scientific report on glyphosate was part of Monograph Volume 112. That Monograph covered five -- four or five pesticides, it was diazinon and tetrachloroethylene, and there were -- there

11:35:33 were three or four others.

And in the malathion section, there's a long treatment and discussion about the methodology in the agricultural health study, which is -- plays a role in all of them.

11:35:48 And they just go into a lot of the methodological details on how they do exposure assessments in that -- in that one malathion part of the Monograph, and they don't repeat it five times.

Q. Okay. So addition to looking at exposure in

11:36:03 occupational settings in our environment, households, they actually did a full-on exposure assessment in the epidemiological literature itself; right?

A. Well, they tried to glean all information they could from studies published in peer-reviewed journals on

11:36:21 exposure, and then when they evaluated the epidemiological studies, they did the same thing.

Q. So if someone were to say, hey, epidemiology, that's in the real world, and IARC didn't look at the real world, is that accurate?

11:36:33 A. Oh, epidemiological studies are always done in the real world. They're based on typically focusing on a population that was exposed to the pesticide. And so they really try to recognize whether there's any potential linkages between real-world exposures and a

11:36:56 disease outcome.

Q. And so when Dr. Goldstein told this jury they did not take into account real-world exposure data, was that true?

A. No.

11:37:07 Q. All right. I want to go back to the Monograph because there's another sort of issue that's been arising again, actually.

Earlier in his deposition, Dr. Goldstein stated, referring to IARC, "They look at only a subset of

11:37:35 available information. They cherry-pick the data that they wanted to focus on rather than looking at the broader weight of evidence."

Do you see that? Okay. So that's what he's testified to.

11:37:47 Is that true?

A. I don't think that's a fair characterization of the IARC process. They -- the big difference between IARC and, say, an EPA risk assessment is that IARC relies only on scientific studies published in peer-reviewed

11:38:06 journals, where all the data is available, the methods are available, the science is transparent, if you will, fully explained. Whereas, regulatory agencies, and in the case of the US the EPA, largely base their risk assessments on registrant-done studies and only on the

11:38:31 pure active ingredient, so it's a very different science

base.

Q. And when we look at the preamble --

MR. WISNER: Permission to publish again, your Honor? It's been published a few times.

11:38:41 THE COURT: Yes.

MR. WISNER: It is Exhibit 166.

Q. All right. We're looking at page 9 of the preamble.

Do you see that, Doctor?

11:38:55 A. Yes, I do.

Q. And it says, "Quality of studies considered."

Do you see that?

A. Yes.

Q. And it reads: "It is necessary to take into

11:39:03 account the possible roles of bias, confounding and chance in the interpretation of epidemiological studies. Bias is the affect of factors in the study design or execution that can lead erroneously to a stronger or weaker association than, in fact, exists between the

11:39:21 agent and disease.

"Confounding is a form of bias that occurs when the relationship with disease is made to appear stronger or weaker than it truly is as a result of an association between the apparent causal factor and another factor

11:39:35 that is associated with either an increase or decrease in

the incidence of the disease.

"The role of chance is related to biological variability and the influence of sample size on the precision of estimates of effect."

11:39:48 Do you see that, Doctor?

A. Yeah.

Q. This is talking about, sort of, the fact that IARC, kind of, goes through all the biases and issues and the epidemiology before it issues its opinion; right?

11:39:59 A. Right. If you read through the Monograph on glyphosate, for example, essentially every study, they kind of rate the quality of it. They might say, "This is a weak study." "It's a very strong study." "This study took into account possible other exposures to different

11:40:16 pesticides."

Their -- one of the things that IARC does, I think, certainly better than any regulatory agency around the world, is really critically evaluate the quality of the individual studies so that they put the most weight

11:40:32 on the best studies.

Q. Let's look at the Monograph, Doctor, since you mentioned it. It's Exhibit 169.

MR. WISNER: I assume I can still publish it, your Honor?

11:40:42 THE COURT: Yes.

MR. WISNER: Old school here. All right. We're back at 169.

Q. And I'm going to start flipping through this a little bit to, sort of, give the sense of this. And the jury will have this to look at, so I want to give them a sense of what we're doing here.

So if you look at, for example, this is -- this is a table, Table 2.

Do you see that?

11:41:02 A. Yeah, yes. I'm familiar with it.

Q. All right. And, for example, it's referring to studies of carcinogenicity with glyphosate in rats. We've talked about that already; right?

A. Yeah.

11:41:10 Q. And then it goes through all these comments, and it says -- discusses the thing, and at the end it says, "The Working Group concluded this was an inadequate study for the evaluation of glyphosate carcinogenicity"; right?

A. Correct.

11:41:23 Q. So they actually have a study that they looked at and said, "Hey, this isn't good enough. We're not going to look at it."

A. Yes.

Q. Is that cherry-picking?

11:41:36 A. No, no. Heavens, no. That's applying rigorous

scientific criteria to a -- the body of research so that they can place the most weight on the most reliable research and not be misled by a bunch of other studies that really don't shed much credible light on the topic.

11:41:54 Q. And elsewhere in here it said -- I'll just give you another example. Find epidemiology, since we talked about that earlier. This is looking at bacteria. One second. Let's look at another table, just to give a sense of what they're doing. So here's page 13 from the

11:42:20 Monograph.

Do you see this, Doctor, page 13?

A. Yes.

Q. All right. And then here's another table. This is Table 2.1.

11:42:26 Do you see that?

A. Yes, yes.

Q. And this looks like it's talking about different types of cancer. We've got childhood cancer, breast cancer.

11:42:35 Do you see that?

A. Yes, sir.

Q. If you look at the right, it has comments; right?

A. Correct.

11:42:41 Q. And it says, "Strengths: Large cohort, specific

assessment of glyphosate. Limitations: Based on self-reported exposure, potential exposure to multiple pesticides, limited power for glyphosate exposure."

Do you see that?

11:42:56 A. Yes.

Q. And so what the Monograph participants are doing is they've actually looked at each study and they look at the strengths and the weaknesses, and then they've told people who are reading it what those are?

11:43:09 A. That's exactly right. The virtue of IARC is that they're completely transparent in the studies that they reviewed and their sense of the validity or relevance of the studies. Very clear. And there's a table like that in all of the different sections.

11:43:24 Q. So in light of the things that we've been talking about, when Dr. Goldstein told this jury they cherry-picked data they wanted to focus on rather than looking at the broader weight of evidence, is that a correct characterization of IARC?

11:43:40 A. I would definitely disagree with that characterization.

Q. Now, Doctor, the scientists that participated in IARC, there was about 17 of them; is that right?

A. I believe that's the number.

11:43:52 Q. And they didn't work for any pesticide

companies, did they?

A. I doubt any of them did, no.

Q. But some of them did work for regulatory agencies; right?

11:44:01 A. Or during -- part of their career, yes.

Q. And there were a couple people from the EPA that were there?

A. Yes.

Q. The Director of the California EPA was there;

11:44:10 right?

A. Correct.

Q. And all those participants, they unanimously classified glyphosate as a Class 2 -- 2A carcinogen; right?

11:44:22 A. That was the final classification of the Working Group, correct.

Q. I want to, kind of, contrast it with the EPA for a second, because you studied the EPA; right?

A. Yes.

11:44:34 Q. And the EPA looked at it in the '70s, and they concluded that glyphosate -- they didn't think it caused cancer; right?

A. They didn't have any valid studies in the '70s, so they didn't reach a judgment.

11:44:47 MR. GRIFFIS: Objection. Your Honor --

THE COURT: Sustained.

MR. GRIFFIS: -- violation of the orders.

THE COURT: Sustained.

Q. BY MR. WISNER: Let's start with the '80s; right?

11:44:53

A. Okay.

Q. Well, actually, we can't; right? If I say -- if I ask: "In the '80s, did the EPA find that it was a carcinogen," what would your answer be?

A. There's what they did.

11:45:03

Q. Yeah. So in the '90s, they concluded it wasn't a carcinogen; right?

A. The conclusion was changed in 1991, correct.

Q. All right. So in 1991 to the present -- what year are we in 2018? Do you know how many years that is?

11:45:15

A. Seventeen -- twenty-seven.

Q. So for 27 years, the EPA has been telling people, "Hey, this stuff doesn't cause cancer"; right?

A. That's been their -- their conclusion, correct.

Q. And if they were to come out tomorrow and say, "Hey, actually, it does," they'd have to admit they've been wrong for 30 years?

11:45:30

A. I think that they would -- they would communicate to the public that science has moved on. There are more effective studies, and, you know, since

11:45:43

the EPA is -- they're not just concerned about evaluating studies. They're responsible for dealing with the risk to the American public, and so they would clearly take into account the huge change in exposure that had occurred, and that -- they could change their mind. Sure.

11:45:59

Q. But when IARC got together in March of 2015, they didn't have a dog in the fight, did they?

A. Not really, no.

Q. IARC hadn't ever assessed glyphosate; right?

11:46:12

A. I don't believe they had, no.

Q. They hadn't said, "Hey, it's safe"; right?

A. They hadn't evaluated it.

Q. And IARC had no interest one way or the other of looking at the science as it existed in 2015 about whether or not it caused cancer?

11:46:25

MR. GRIFFIS: Leading, your Honor.

THE COURT: Well, overruled.

You may answer this question.

THE WITNESS: No, they hadn't. Your description they had no dog in the fight, they were a group of scientists with long experience in the evaluation of animal carcinogenicity studies, genotox studies, epidemiological studies, environmental fate studies, and among them, across all the disciplines that they were --

11:46:36

11:46:55

some of them internationally well-recognized experts, they reached their independent judgment.

Q. BY MR. WISNER: Was it unanimous?

A. Pardon me?

11:47:08 Q. Was it unanimous?

A. Yes.

Q. I understand you've spoken to Dr. Blair about the IARC meeting; is that right?

A. Yes, correct.

11:47:16 Q. What did he tell you?

MR. GRIFFIS: Hearsay.

THE COURT: Sustained.

Q. BY MR. WISNER: Do you understand personally whether or not IARC actually considered putting it in

11:47:28 Group 1?

A. I'm aware of that --

MR. GRIFFIS: Objection. Calling for hearsay.

THE COURT: Sustained.

Q. BY MR. WISNER: When is the last time you talked

11:47:42 to Dr. Blair?

A. I talked -- I sent an email and had a short phone conversation with him maybe in November or early December, because I had read in one of the many media stories --

11:48:01 Q. Don't -- don't disclose that.

MR. GRIFFIS: Objection. Your Honor.

Q. BY MR. WISNER: Don't disclose this. I just want to know the last time you spoke to him.

A. I would say either November or early December of 2017.

Q. That's after the classification; right?

A. Correct.

Q. Now, you have -- last topic. We're almost done here. I understand you've actually looked at the rise or change of glyphosate in pesticides use in the United States for some time; is that right?

A. Yeah, it's one of the things I've been active in for many, many years.

Q. You've actually published an article about that; right?

A. Yes, I have two papers on the trends and the use of glyphosate-based herbicides in the US.

Q. And I understand one of them -- how many times has the first one been downloaded?

A. Almost 300,000 times. It's kind of a very unusual phenomenon for a scientific paper to be accessed that many times.

Q. Wait. Hold on. Do you get royalties on that?

A. Unfortunately, no.

Q. I understand you prepared a demonstrative to

discuss the change in pesticide use?

A. Yeah, I did.

MR. WISNER: Your Honor, permission to publish Exhibit 1043?

11:49:15 THE COURT: Any objection?

MR. GRIFFIS: No objection.

THE COURT: Very well. You may proceed.

Q. BY MR. WISNER: All right. Doctor, this is the demonstrative that you've prepared; right?

11:49:40 A. Yes.

MR. WISNER: Your Honor, permission for him to come down and walk us through what this says?

THE COURT: Yes, that's fine.

THE WITNESS: Is that all right?

THE COURT: Yes.

Q. BY MR. WISNER: Doctor, before you go, if you want to mark it, here's a marker. And use this one (indicating). And stand on this side, so you don't block her view. Okay?

11:50:07 Doctor, what is this document? Explain it to the jury.

A. So over the years, the EPA puts out every few years a report on pesticide use in the United States. So just the volume. So scientists can understand what

11:50:18 pesticides are widely used, which ones are being used

more or less.

And they put this information out in a ranking. They rank the top -- they list 25 pesticides that account for the highest volume of use in agriculture. And they put out reports in '87, '93, '95. All of these years.

So the -- this is the first one they did. And glyphosate, in 1987, which is fairly early in the history of glyphosate use, it ranked number 17. And this is 6 to 8 million pounds used by US farmers and ranchers. All of these numbers are the range that EPA reported in agriculture.

In the first year they did it, this is a -- atrazine's a corn herbicide. It has been, you know, way up in the ranking all throughout, as you can see. I mean it's still -- it's still number 2 all the way to there.

So you see the use of glyphosate, it climbed up the ranking fairly quickly, from 17 to 11 to 7 to 5th. And then we see a much -- pretty big jump here to number 2, where it's only about 10 million pounds behind atrazine, 1999.

In the 2001 ranking, it reached the number 1 spot. It might have happened in 2000. It certainly happened by 2001.

And as you see, it passed atrazine. Atrazine was used -- there was 74 million to 80 million pounds of

atrazine used and 85 million to 90 million of glyphosate used.

Pretty impressive increase in the popularity and -- and use of Roundup-based herbicides. And this applies by glyphosate -- it's a glyphosate-based herbicide. It could be a subjective herbicide. It could be Roundup. Or any other company that had a -- had a label.

But I really want to direct your attention to what happened, you know, after 2001. So glyphosate is -- this is just -- this is being repeated here. Glyphosate stays at the top. It's ranked number 1 in 2001, between 85 million and 90 million pounds.

Look what happens. It rises 40 million pounds in two years. So just think about that. It rises 40 million pounds. That's half as much of what atrazine was used at in a year. This is the rise in glyphosate.

By 2007, only six years later, the use had more than doubled, to 170 million to 190 million pounds.

By 2007, no pesticide in the history of the US has been used that heavily that much in one year. And the use continued to go up.

And by 2012, according to the EPA, 270 million pounds to 290 million pounds were applied by US farmers. Let's just wrap our minds around this growth from 2001 to

2012. So 11 years.

So there was -- let's just say 90 million pounds applied in 2001. Eleven years later, three times as much. So that's --

11:53:53 You know, the other pesticide most heavily used, atrazine, throughout this whole period, it went from 70 to 80 million pounds. The increase in Roundup use -- glyphosate use, from 2001 to 2012, was double that amount.

11:54:13 So there's never been a pesticide really in the US or globally whose use has gone up as dramatically as the case with glyphosate-based herbicides.

And you've heard a lot about different studies that have assessed -- say, the epidemiology. Well, there 11:54:41 are very few epidemiology studies that -- that take into account the uses and exposures to glyphosate-based herbicides in this part of the history of the use of that product.

So we -- scientists will be continuing to study 11:54:59 glyphosate-based herbicides and their impacts on the environment and the public health for years to come. And one of the major reasons is how much is used.

This -- so American farmers harvest about 310, 315 million acres of crops a year. So this is wheat, 11:55:19 corn, soybeans, potatoes, et cetera. You know, the

harvested crops. About 310 billion acres. 290 -- well, today, it's higher than that. 290 million pounds.

So there's really over three quarters of a pound of the glyphosate-active ingredient applied on every cropland acre in America if you spread it out equally.

Now, that's not the way it is. Not every crop gets treated with a glyphosate-based herbicide, but it's a volume of use that we've never had any experience with. EPA hasn't had any experience with something used that widely. And it -- the change came so fast that we're still playing catch-up.

Q. Thank you, Doctor. That was really helpful. Please take a seat.

I'm going to ask a few follow-up questions to, sort of, explore some aspects of this. All right, Doctor?

A. Yeah, sure.

Q. The first issue is -- you know, I want to get a sense of how glyphosate use has changed in the real world between 1987 and 2012.

So in 1987, what was the general distribution of Roundup use amongst the world? In the US, sorry, I should say.

A. Well, there were -- at that time, there was about two-thirds of it were applied by farmers to control

weeds and agricultural weeds in the fields. And about one-third in home, industrial weed control along roads and right-of-ways. So the non-agriculture. That was a split, about two-thirds and one-third.

11:57:06 And in 1987, I would say there were probably, maybe, 60 crops, 50 crops, that Monsanto had --

Q. Don't talk about that.

A. Okay.

Q. Continue -- I just want to know how it was used.

11:57:20 A. Oh, okay.

Q. 60/30. Okay. All right.

So -- and then by 2012, what's the distribution between the farmers and then everyone else?

A. It's about 90 percent of the use is agricultural

11:57:33 and 10 percent are the other uses.

Q. And I want to ask you a little bit about -- you know, since you're an agricultural economist, you'll have some insight into this. When you're using glyphosate or Roundup on a farm, how is it typically applied?

11:57:51 A. It's -- it's applied by -- some sprayers or pulled behind a tractor. But much commercial farms now there's dedicated machines that just are built and designed to apply pesticides. And herbicides account for almost three-quarters of all pesticide use.

11:58:11 So the application equipment is very much

designed to accommodate large-acreage use, rapid spraying. And the operator is inside a cab with glass and a sophisticated air filtration system. And the industry's done a great job of really minimizing
11:58:33 exposures for people applying it with -- with modern equipment.

Q. Now let's talk about that other portion of users, right, the people that aren't using it on a farm.

A. Right.

11:58:47 Q. What, sort of, use --

MR. GRIFFIS: Objection, your Honor. No foundation for this. And it's cumulative of Dr. Sawyer.

MR. WISNER: It's on the first page of his report.

11:58:56 THE COURT: Overruled. He may answer.

THE WITNESS: Applicators that aren't farmers that are using glyphosate-based herbicides to control the weeds around their house and park, around a school, would use either a backpack sprayer or a hand-held sprayer.
11:59:13 And sometimes there's a unit that gets put in the back of a pickup truck. It's kind of like a power washer.

Q. BY MR. WISNER: And when application is being done that way, is there, like, a -- I guess the exposures are different. Is that fair?

11:59:29 A. Oh, most definitely.

Q. Now, you said that, you know, 30 percent in '87, 10 percent in 2012, are these other uses. What's the vast majority of those other uses? What is that for?

A. So the other non-agricultural uses, the high-volume ones, would be railroads. Spraying them on railroad right-of-ways. Power lines. They've got to control weeds in power lines. We've got a lot of power lines. Pipelines, industrial right-of-ways. And those uses, a lot of them are -- most of them are applied with larger-scale equipment, where the applicator has the comparable level of protection like the farmer that's in an enclosed cab.

Of this 10 percent of glyphosate-based herbicide use roughly today that is nonagricultural, just a small percent, maybe a couple percent, of total glyphosate-based herbicide use is this backpack hand-held -- or if you go into Lowe's Hardware or Home Depot and buy a -- you know, a half gallon bottle of Roundup to control weeds in your driveway, those -- the actual volume of that use is 2 percent, 1 percent of total sales of glyphosate-based herbicides measured by pounds of active ingredient.

Q. Now, Doctor, if you're looking at the epidemiological literature on glyphosate in Roundup, the majority of that literature is about the farmers; right?

A. Well, certainly the agricultural health study was almost exclusively about certified agricultural applicators, yes.

Q. And to be clear, have you actually ever seen an epidemiological study of non-farm use, like people who are using backpack sprayers in the real world?

12:01:23

A. Well, one of the things that distinguishes the different results in the epidemiological literature is actually the proportion of cases that have, you know, a disease, a cancer, that did apply a herbicide or glyphosate-based herbicide using a backpack sprayer or hand-held sprayer. One of those other methods of application that have a much higher typical exposure.

12:01:42

Q. So that's kind of what I want to get at. Now, the jury's heard about cohort studies, and they've heard about case control studies; right? Don't explain those. They know.

12:02:04

But the cohort study and the agricultural health study, that's following a group of, basically, farmers for 30, 40 years; right?

12:02:14

A. Well, certified applicators. Many of them were farmers.

Q. Okay. And then when we look at the other side of the data, the case control studies, that's actually pulling people who got cancer from cancer registries;

12:02:24

right?

A. Correct.

Q. That doesn't necessarily mean farmers, does it?

A. Correct.

12:02:33 Q. It could be regular people spraying in the backyard.

A. Or people that didn't spray any pesticides.

Q. And I know some of those --

MR. GRIFFIS: May I approach, your Honor?

12:02:41 THE COURT: Yes. Perhaps this is a good time for the lunch recess, in any event.

MR. WISNER: Yeah.

THE COURT: All right. Ladies and Gentlemen, we're going to break now for the lunch recess. Please

12:02:53 remember: Do not discuss the case, and we'll resume again at 1:30.

(Jury leaves courtroom.)

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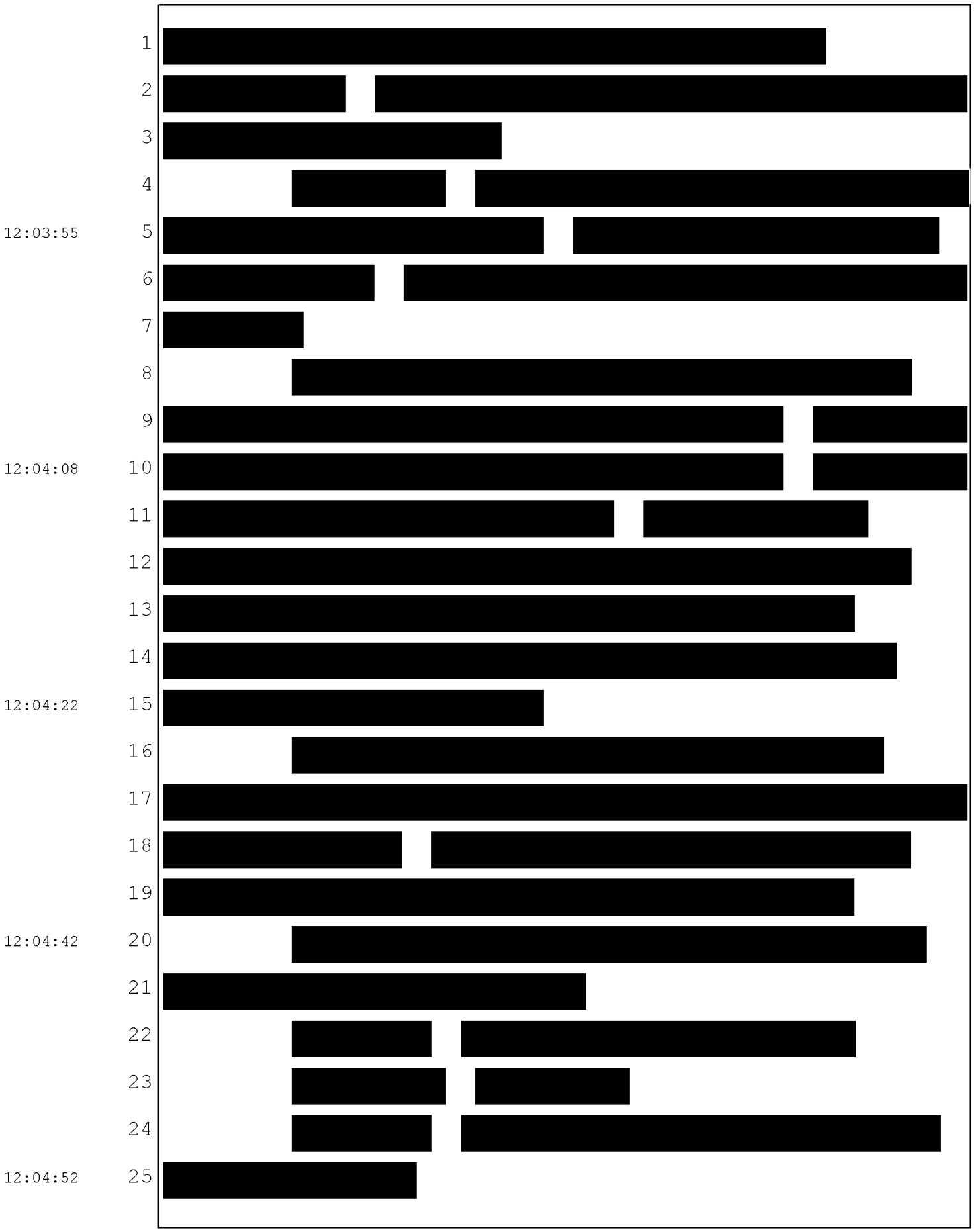
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(Time Noted: 12:04 p.m.)

REPORTER'S CERTIFICATE

I certify that the proceedings in the within-titled cause were taken at the time and place herein named; that the proceedings were reported by me, a duly Certified Shorthand Reporter of the State of California authorized to administer oaths and affirmations, and said proceedings were thereafter transcribed into typewriting.

I further certify that I am not of counsel or Attorney for either or any of the parties to said Proceedings, not in any way interested in the outcome of the cause named in said proceedings.

IN WITNESS WHEREOF, I have hereunto set my hand: July 27th, 2018.

<%signature%>
Leslie Rockwood Rosas
Certified Shorthand Reporter
State of California
Certificate No. 3462