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 Thursday, July 26, 2018, Volume 17, Morning Session, before the Honorable Suzanne R. Bolanos, at 9:08 a.m.

REPORTED BY:

LESLIE ROCKWOOD ROSAS, RPR, CSR 3462

Job No. 2965331A

Pages 3553 - 3666

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INDEX OF PROCEEDINGS

WITNESS	DIRECT	CROSS	REDIRECT	RECROSS
WILLIAM ROBERT SAWYER	3585			

EXHIBITS ADMITTED

(None.)

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Morning Session

San Francisco, California

Department 504

Judge Suzanne Ramos Bolanos

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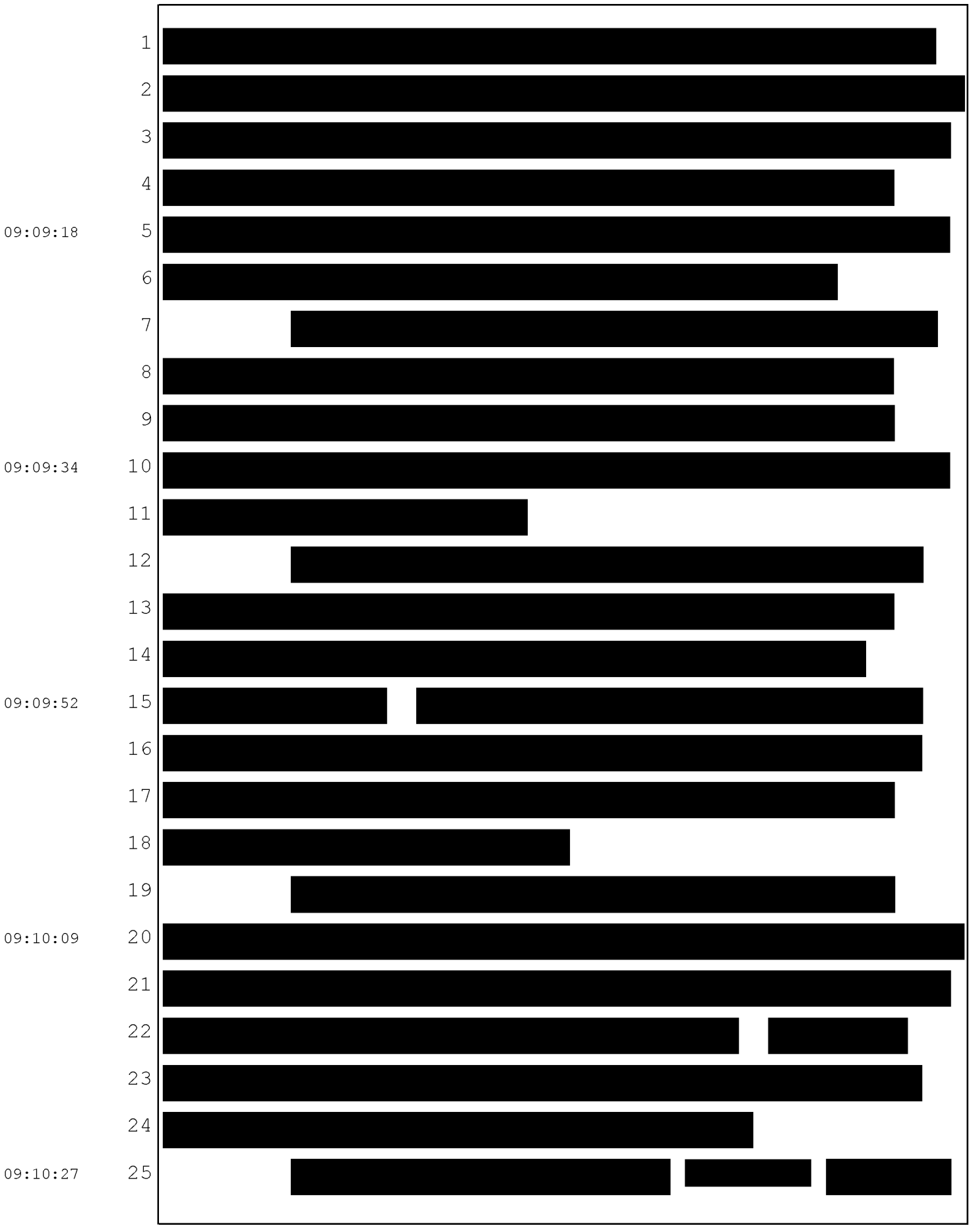
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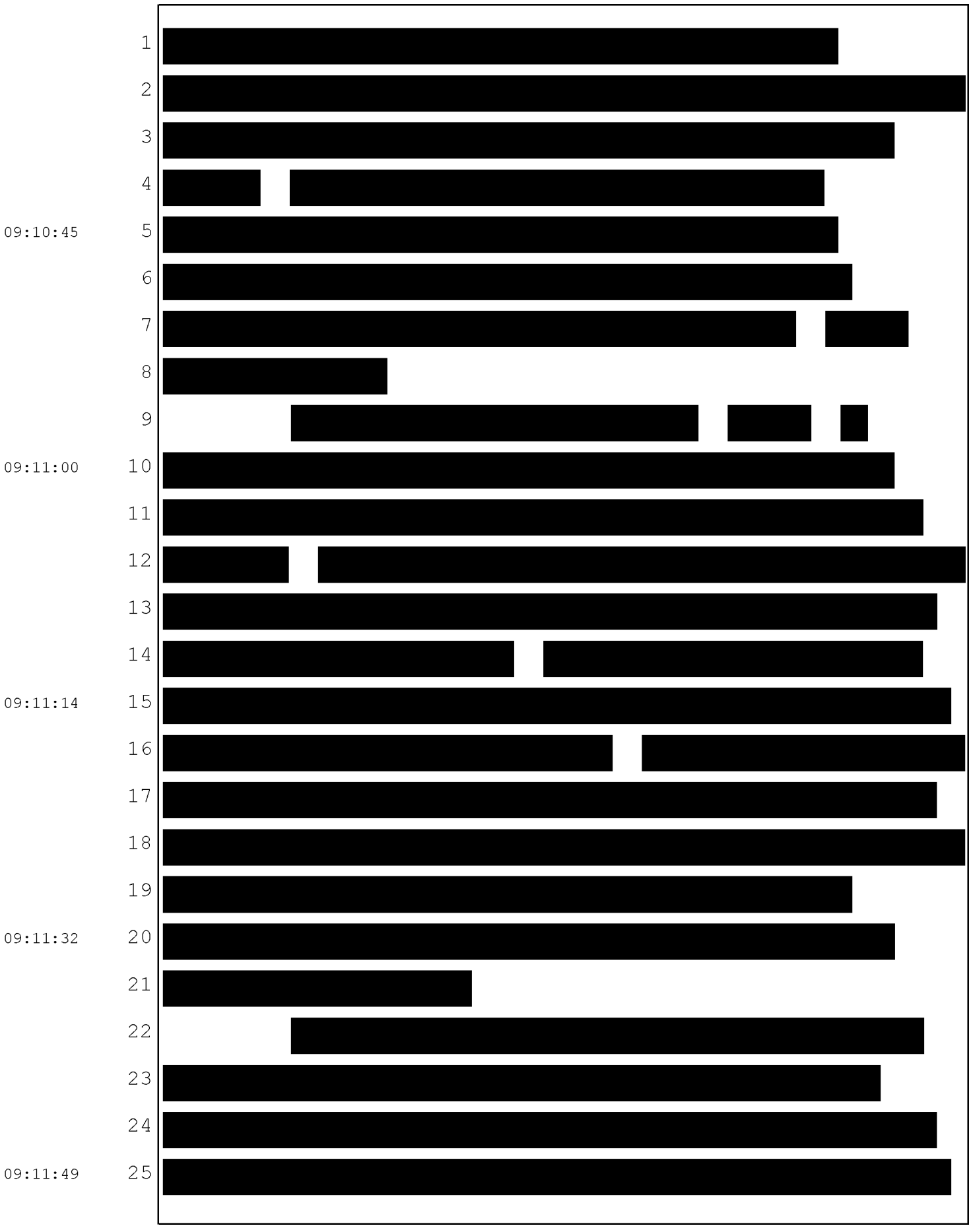
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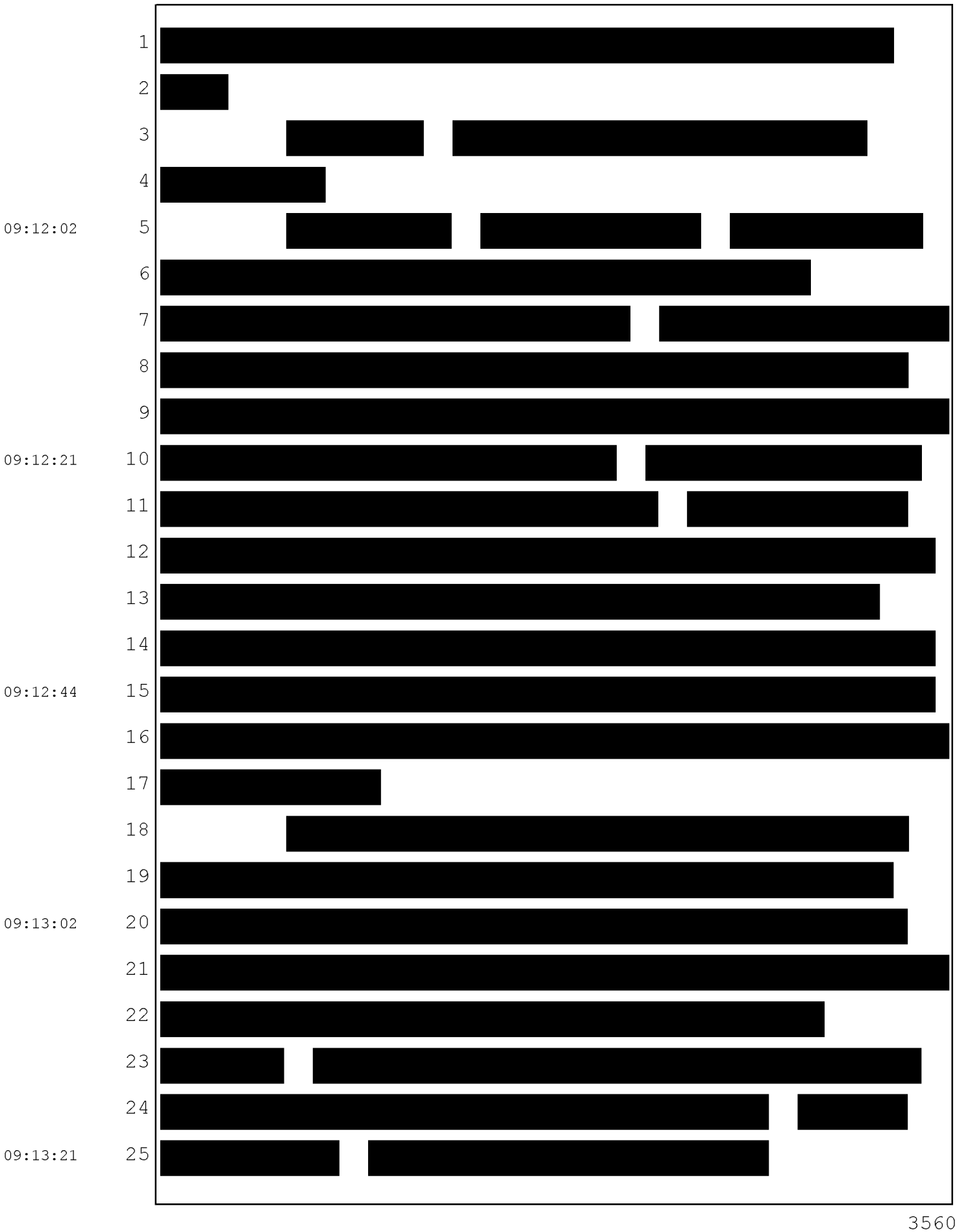
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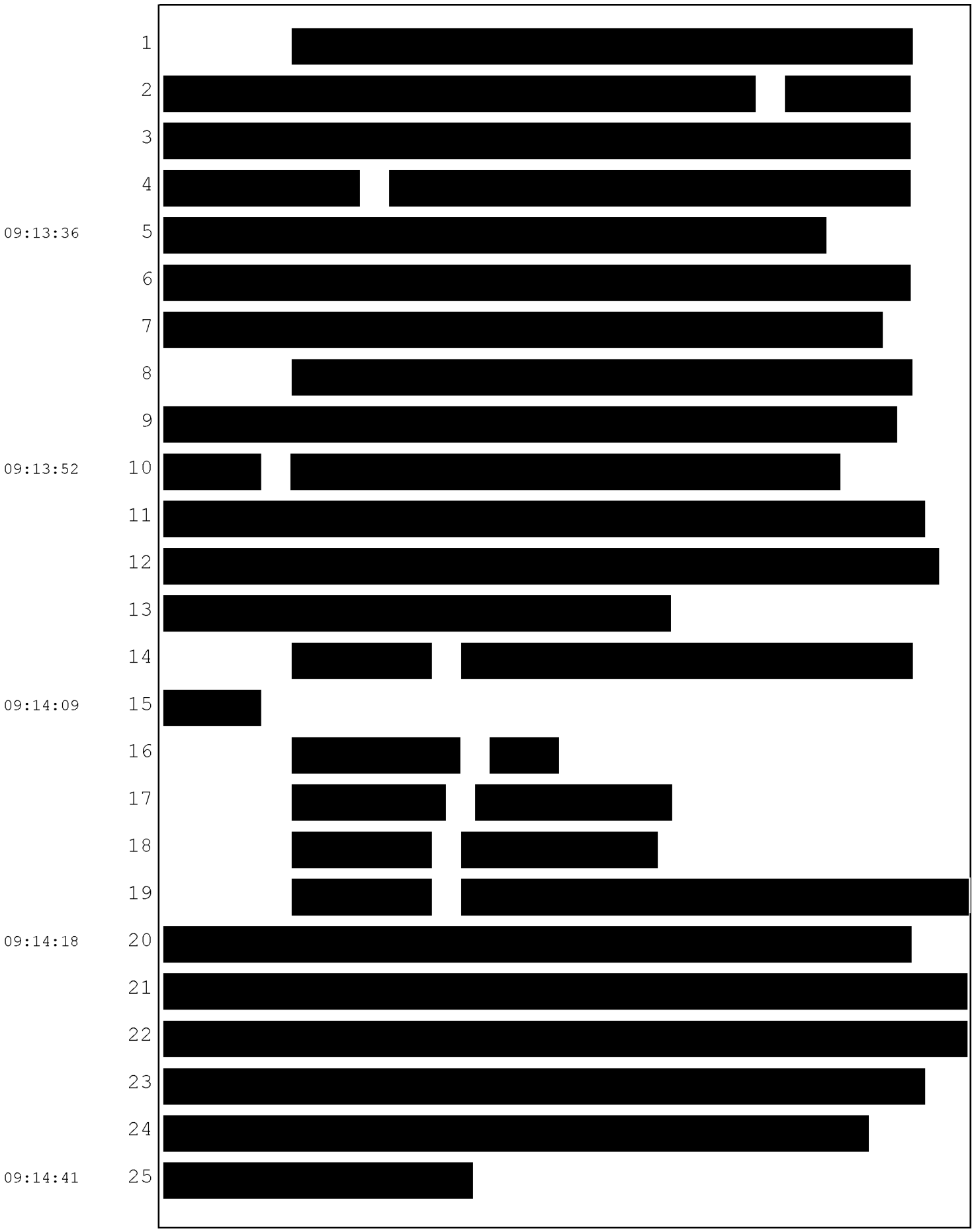
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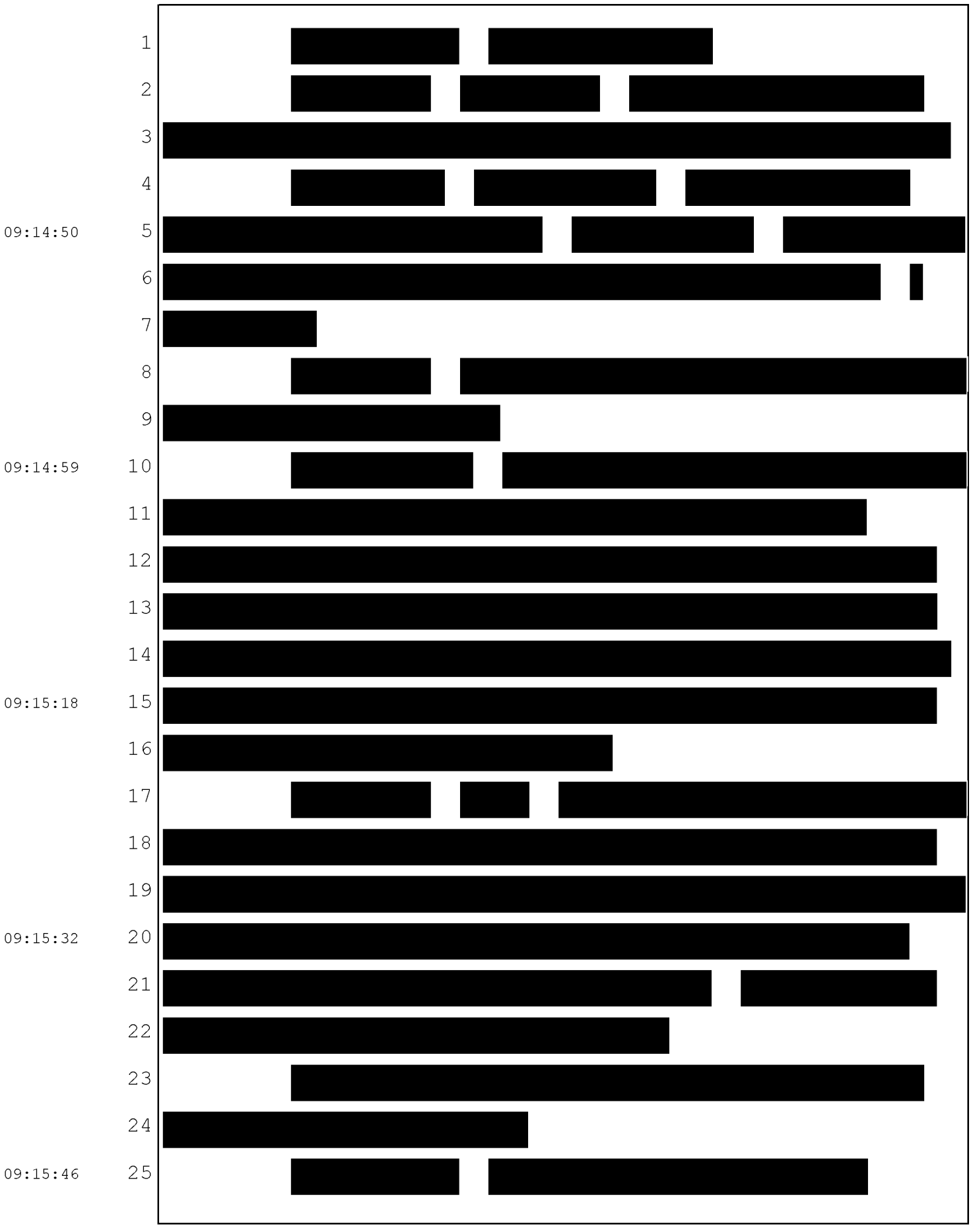
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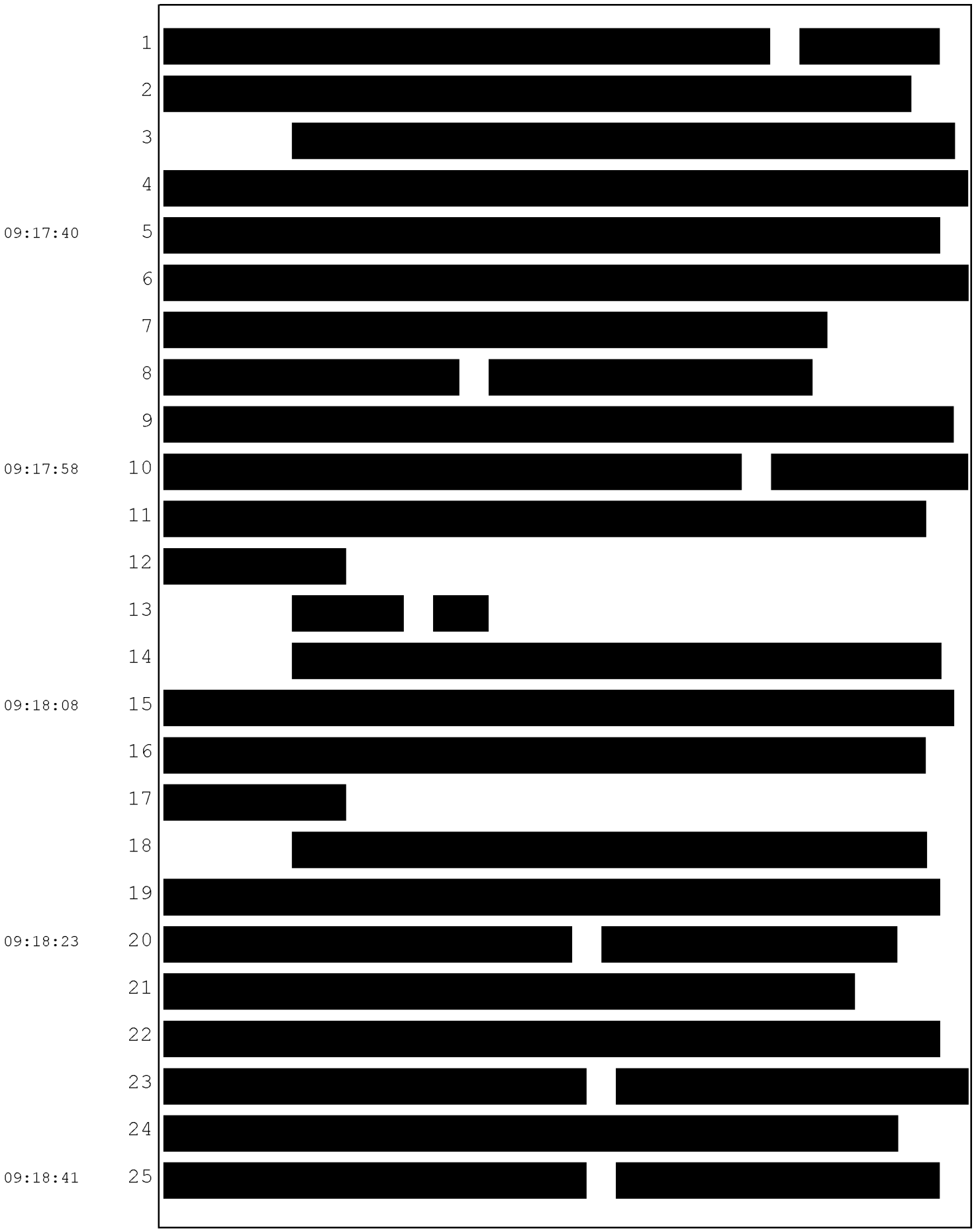
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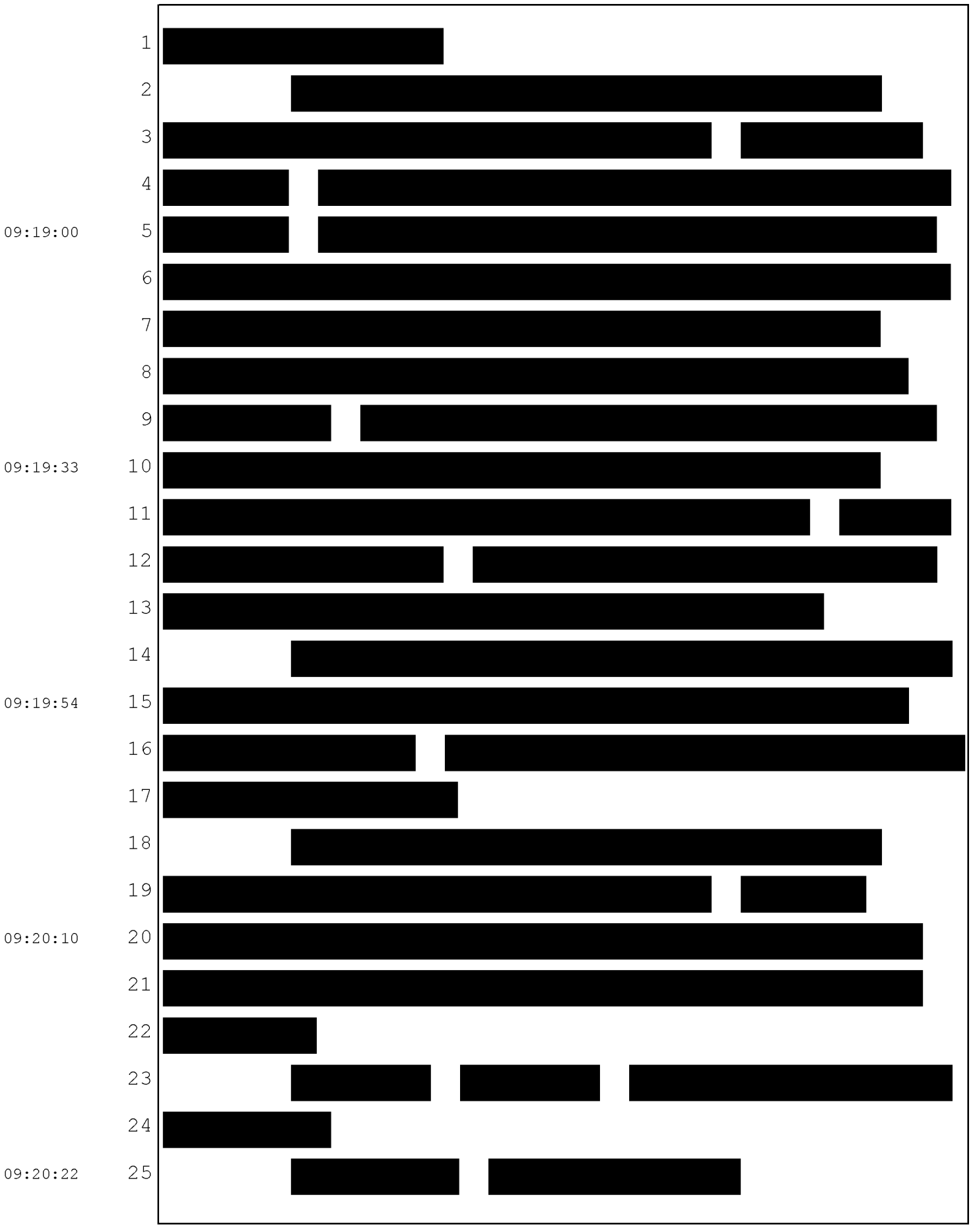
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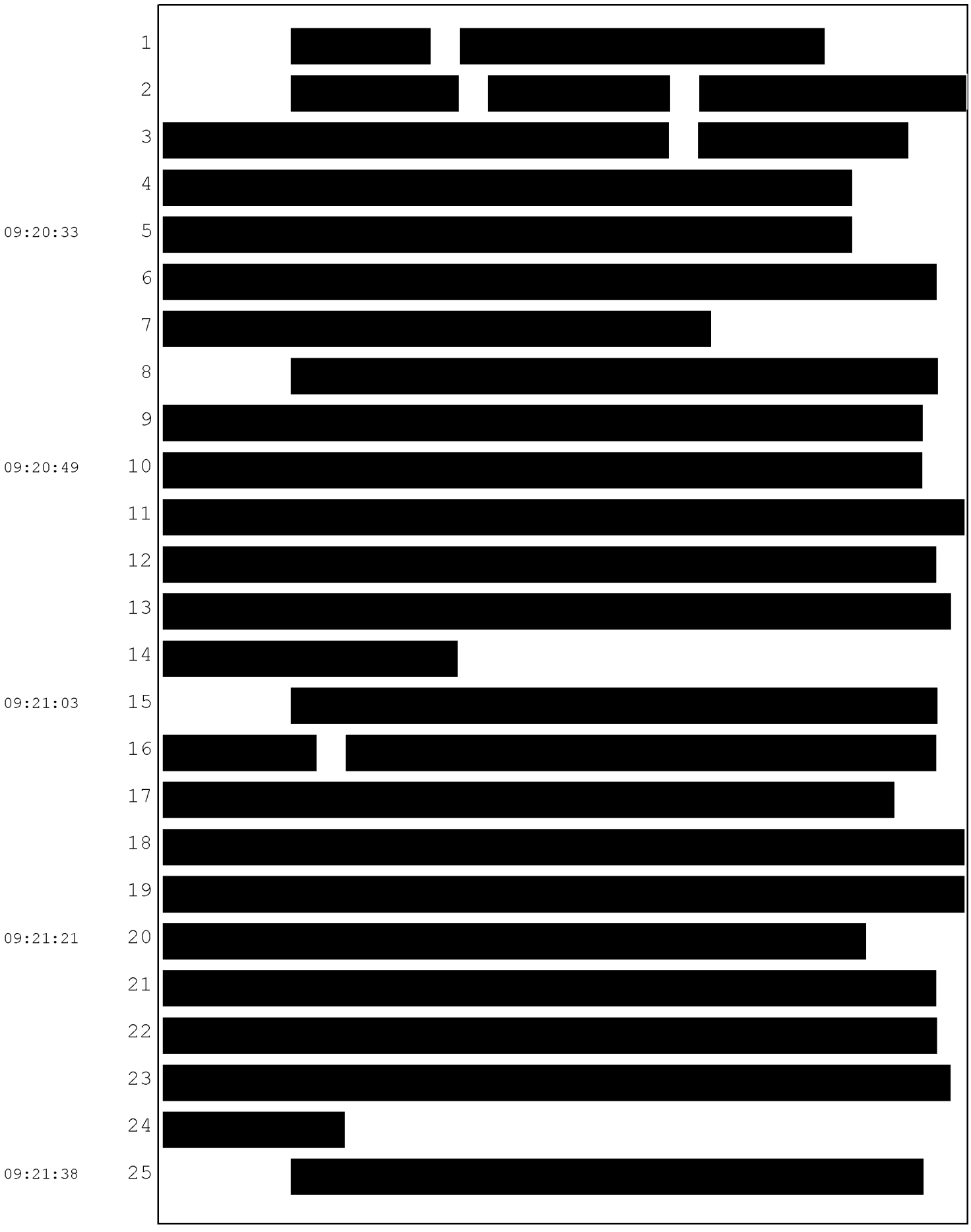
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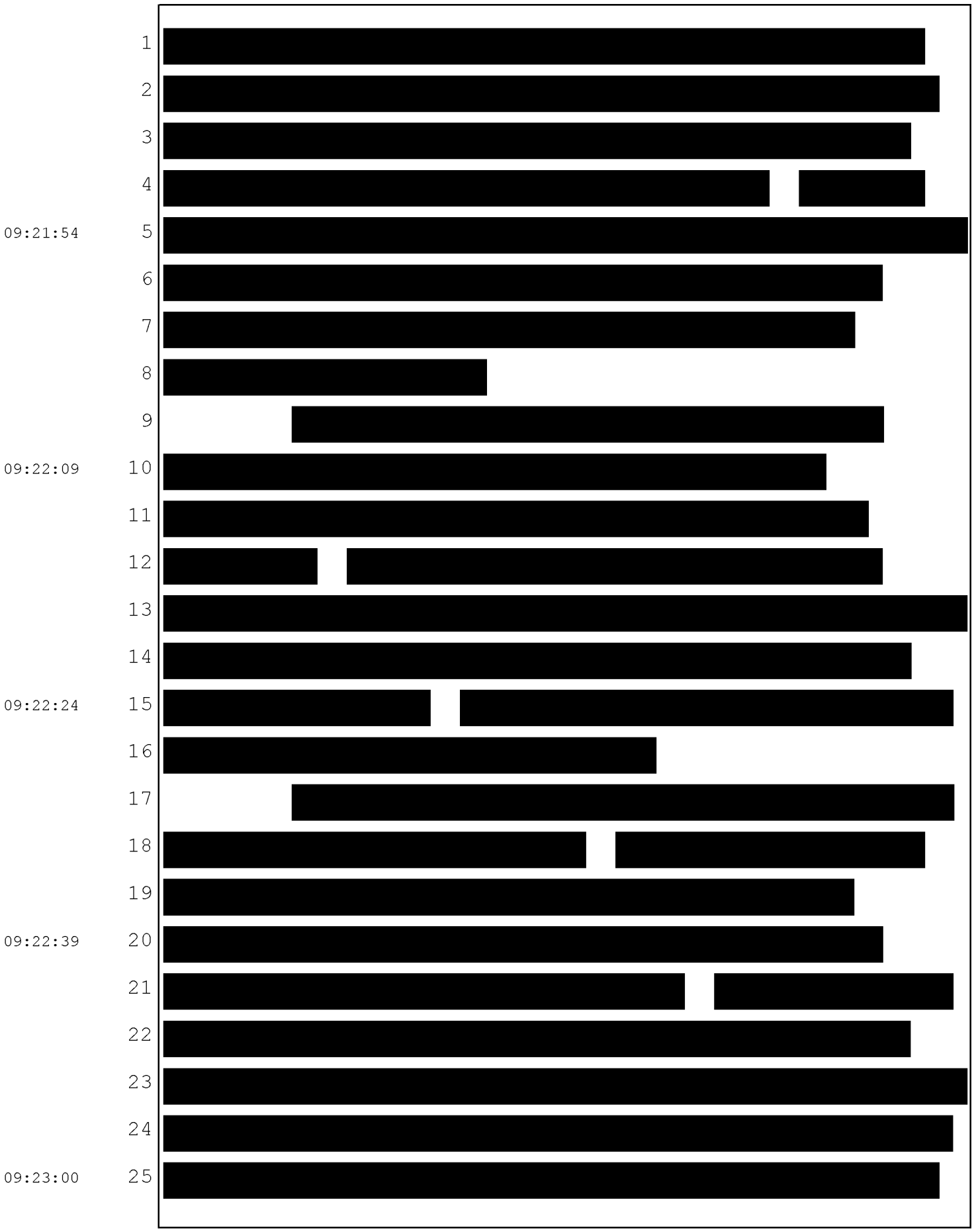
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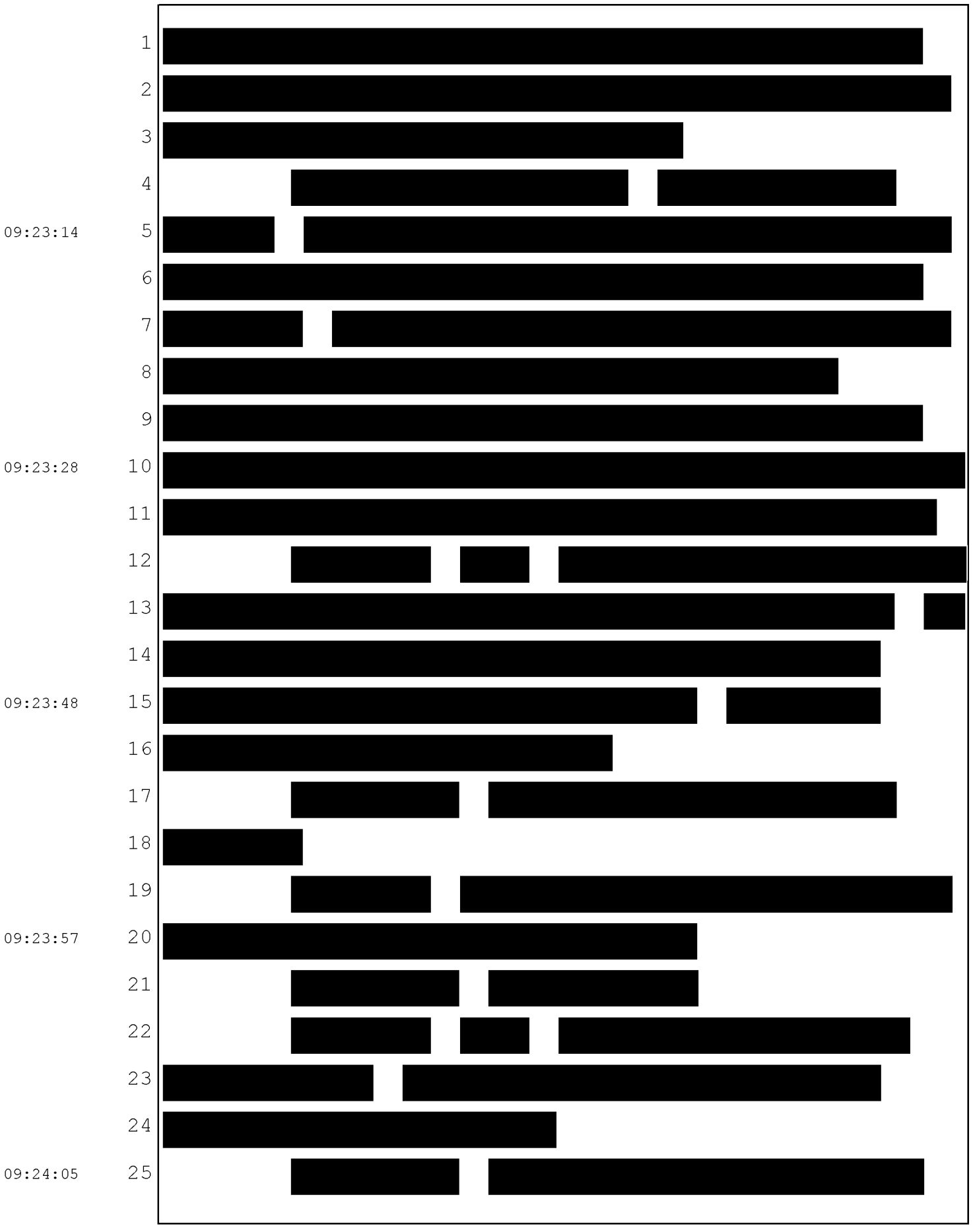
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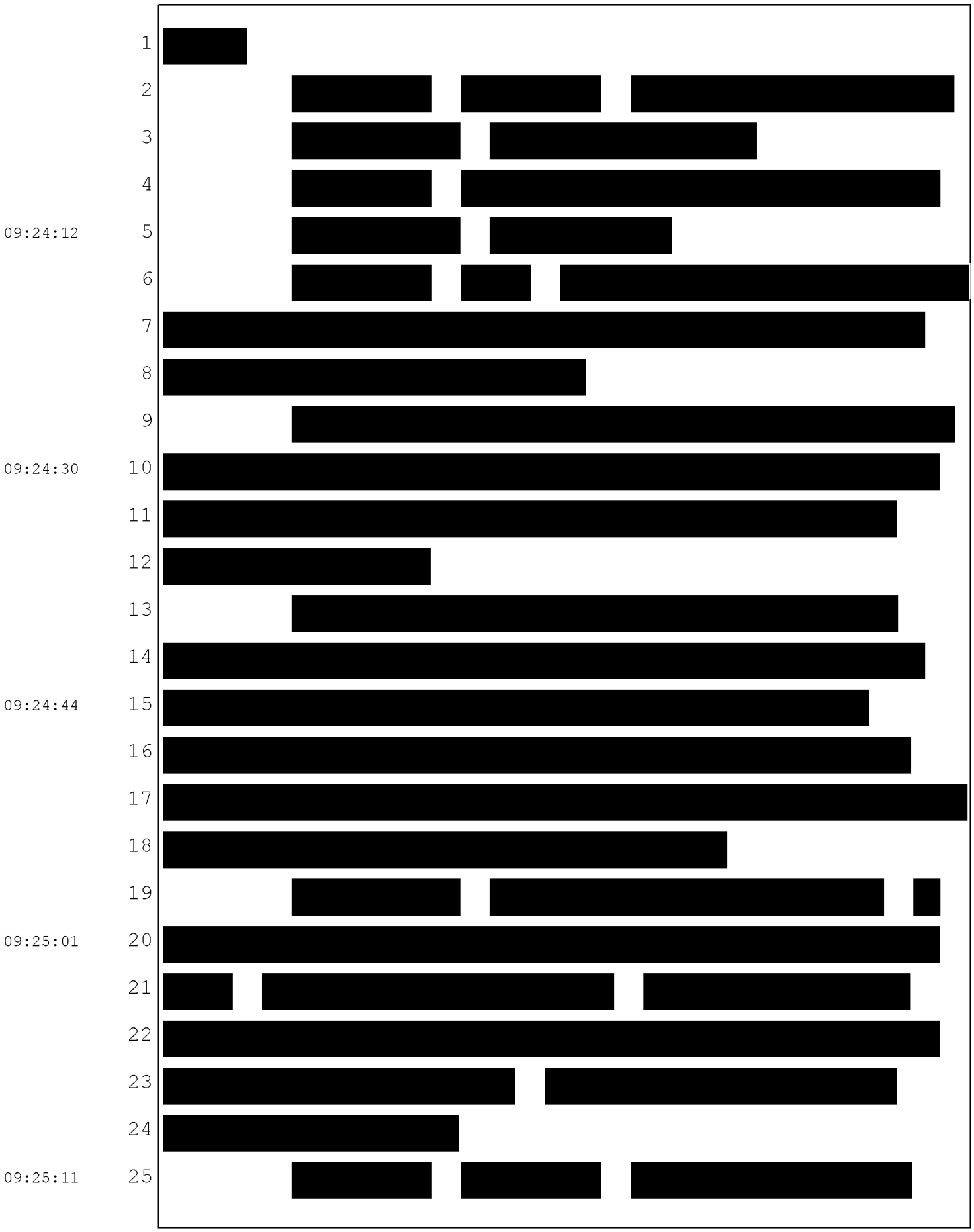
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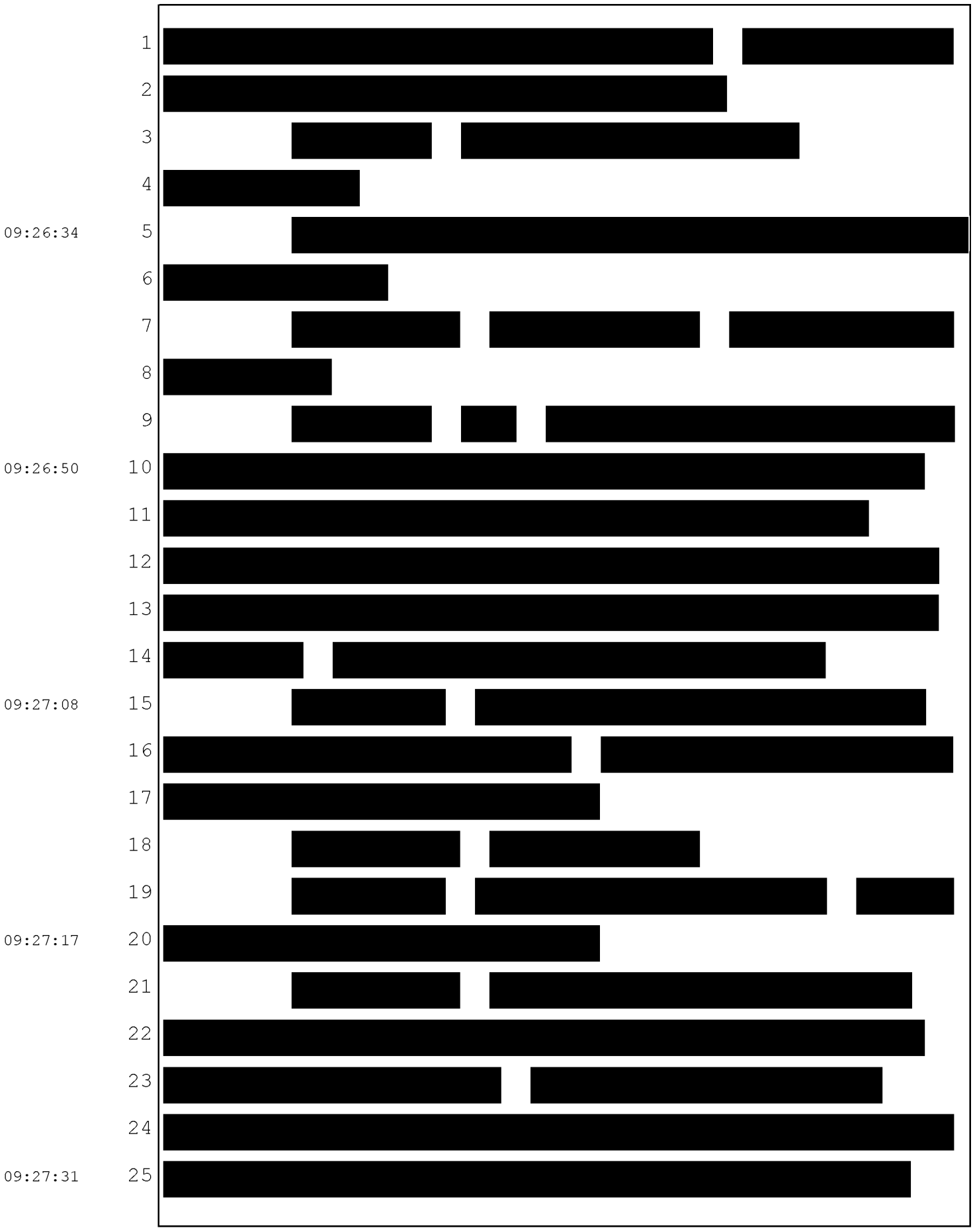
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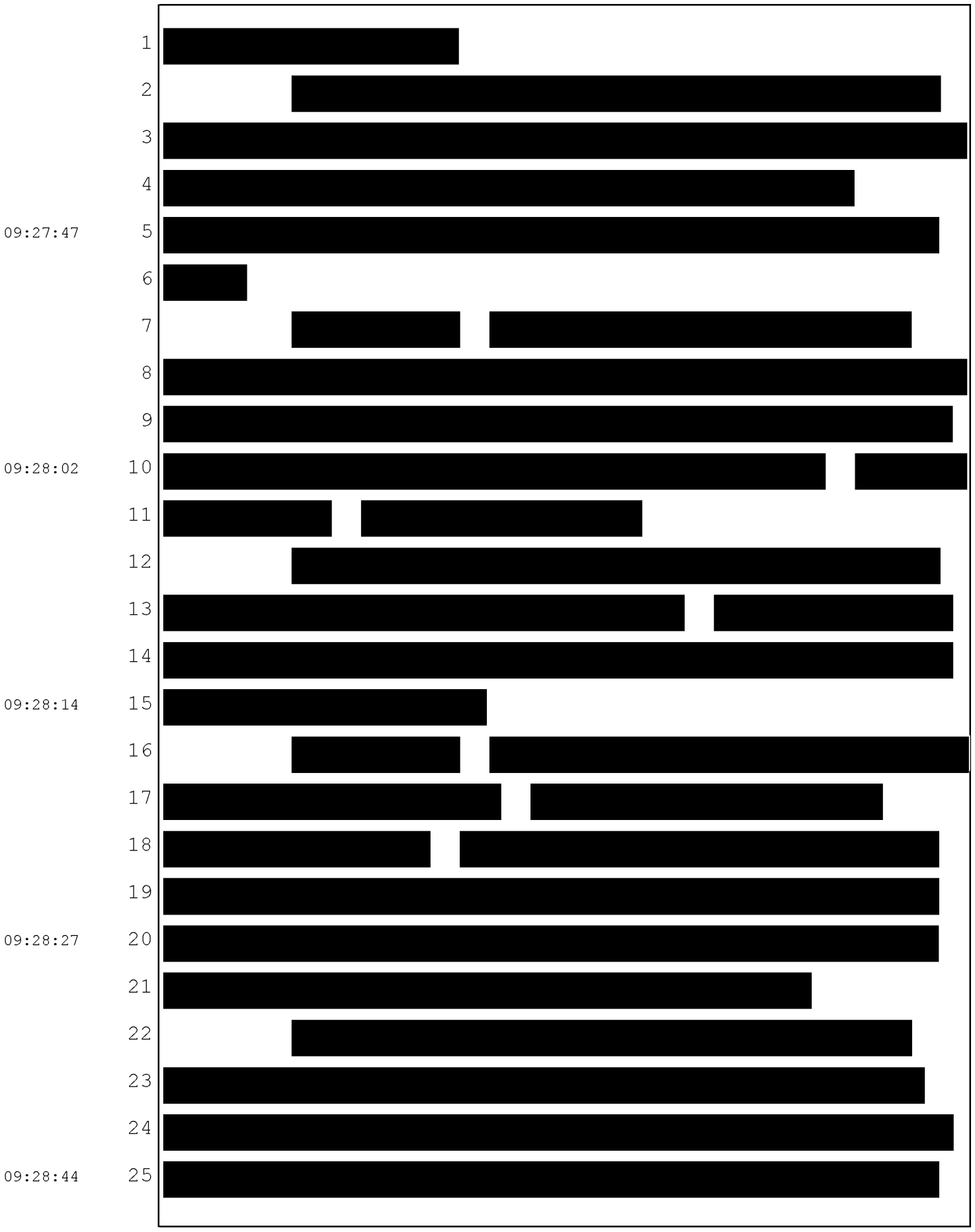
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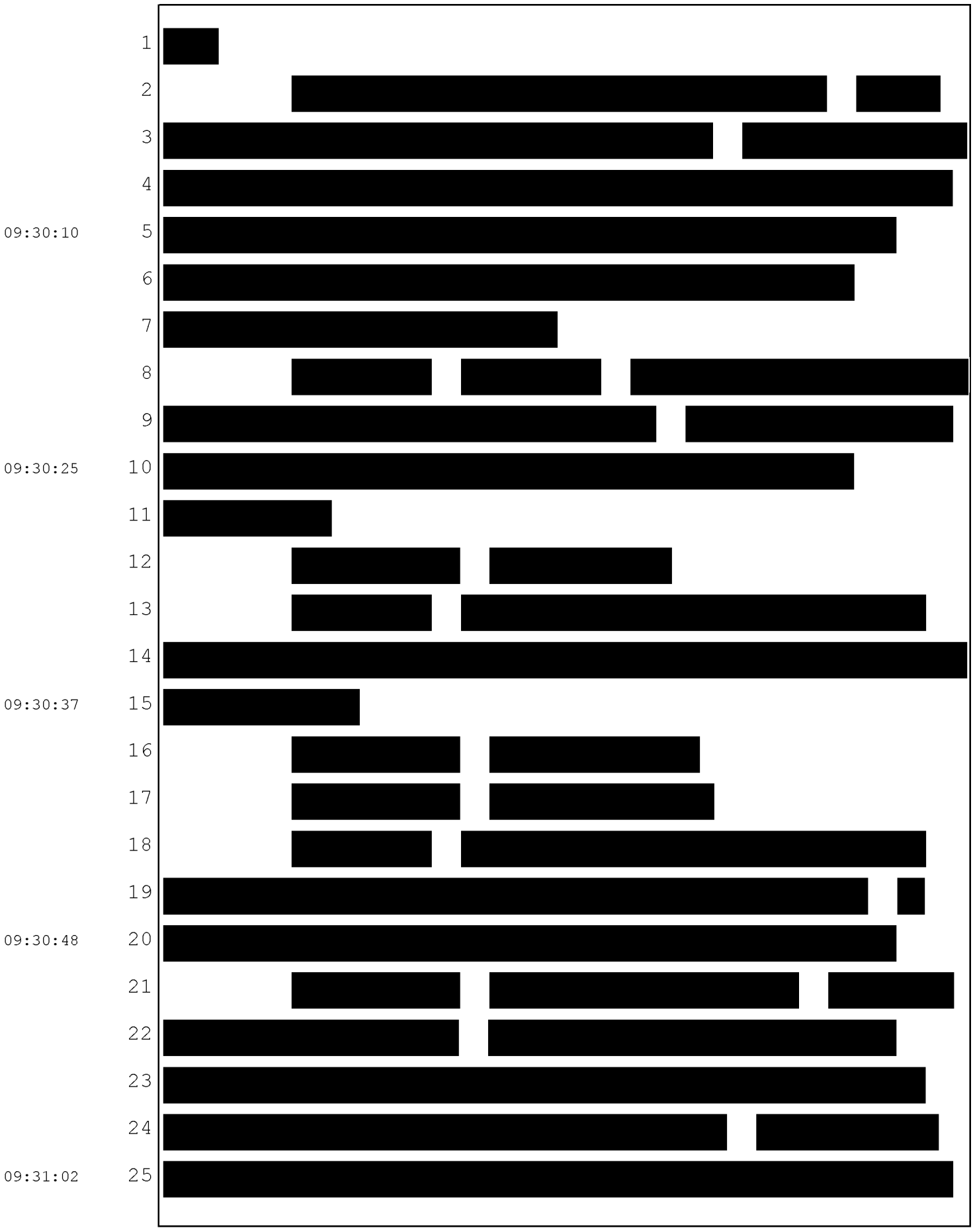
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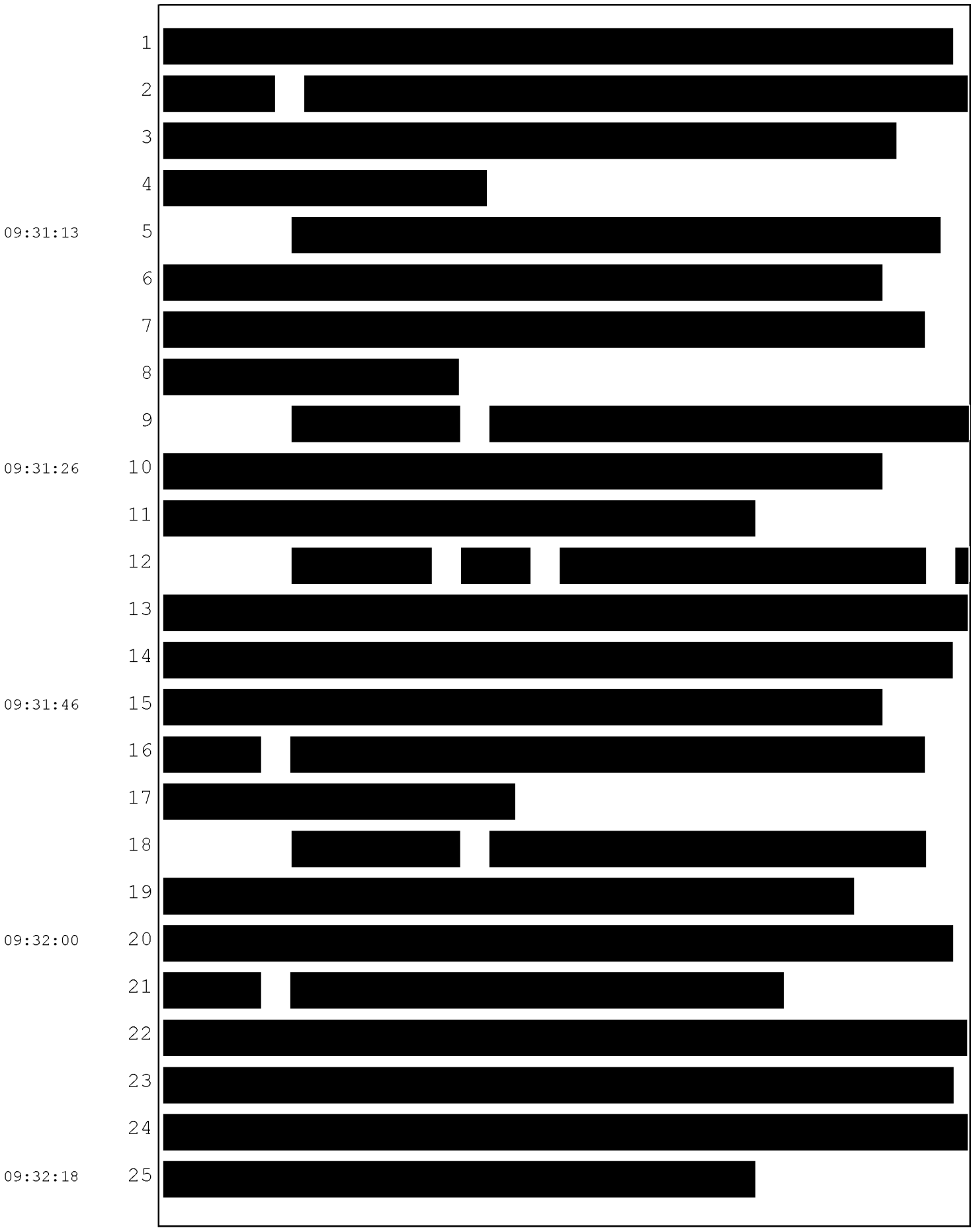
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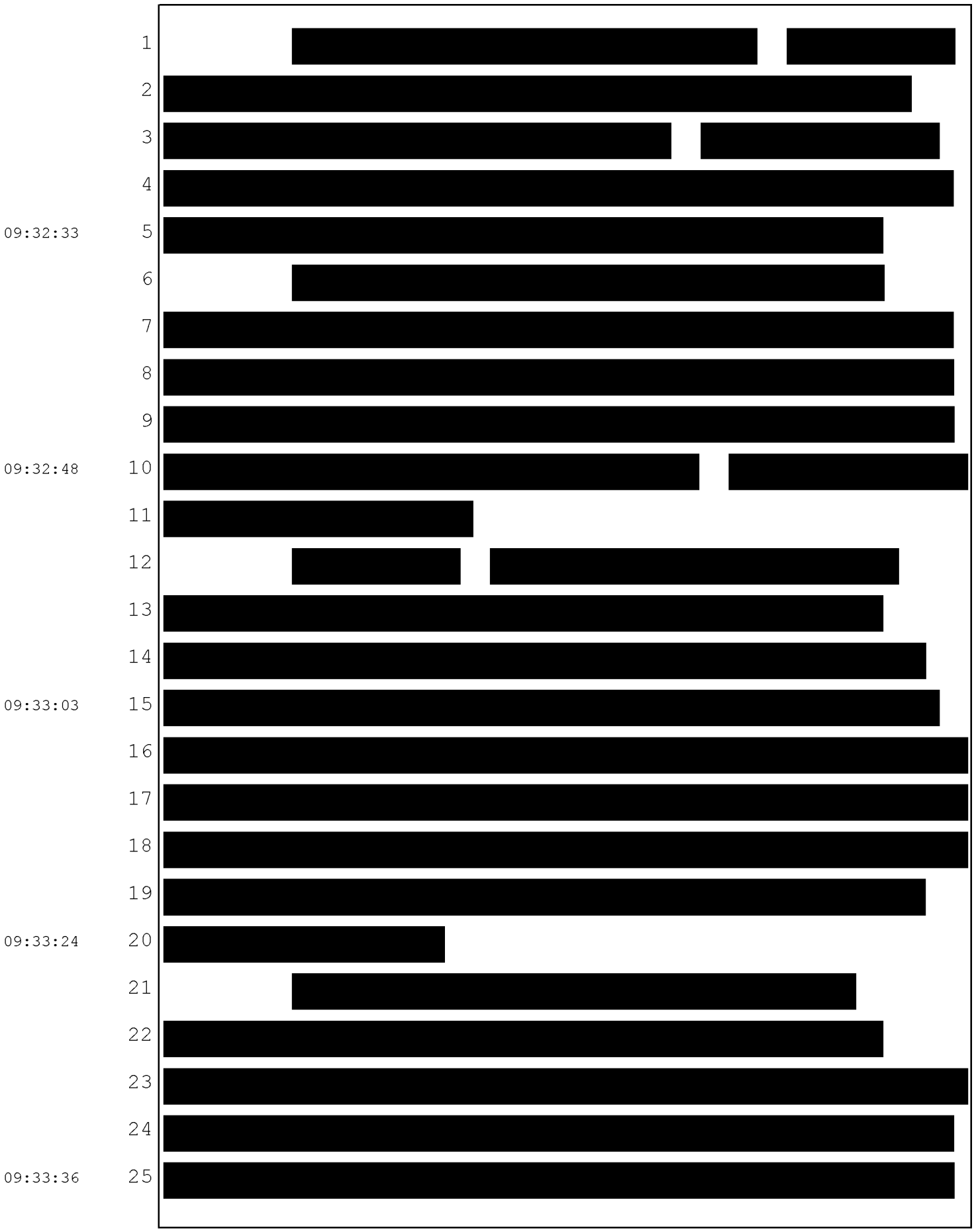
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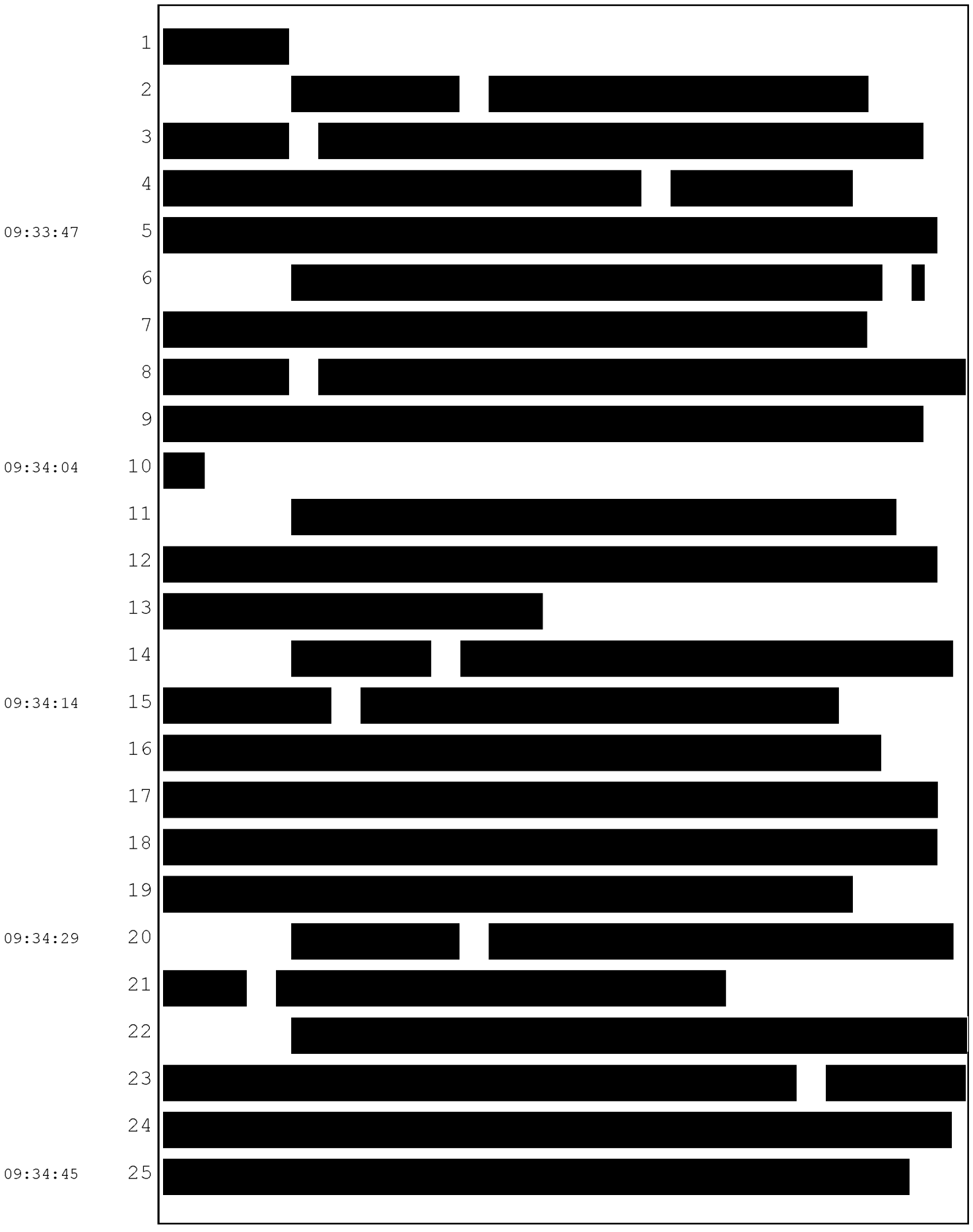
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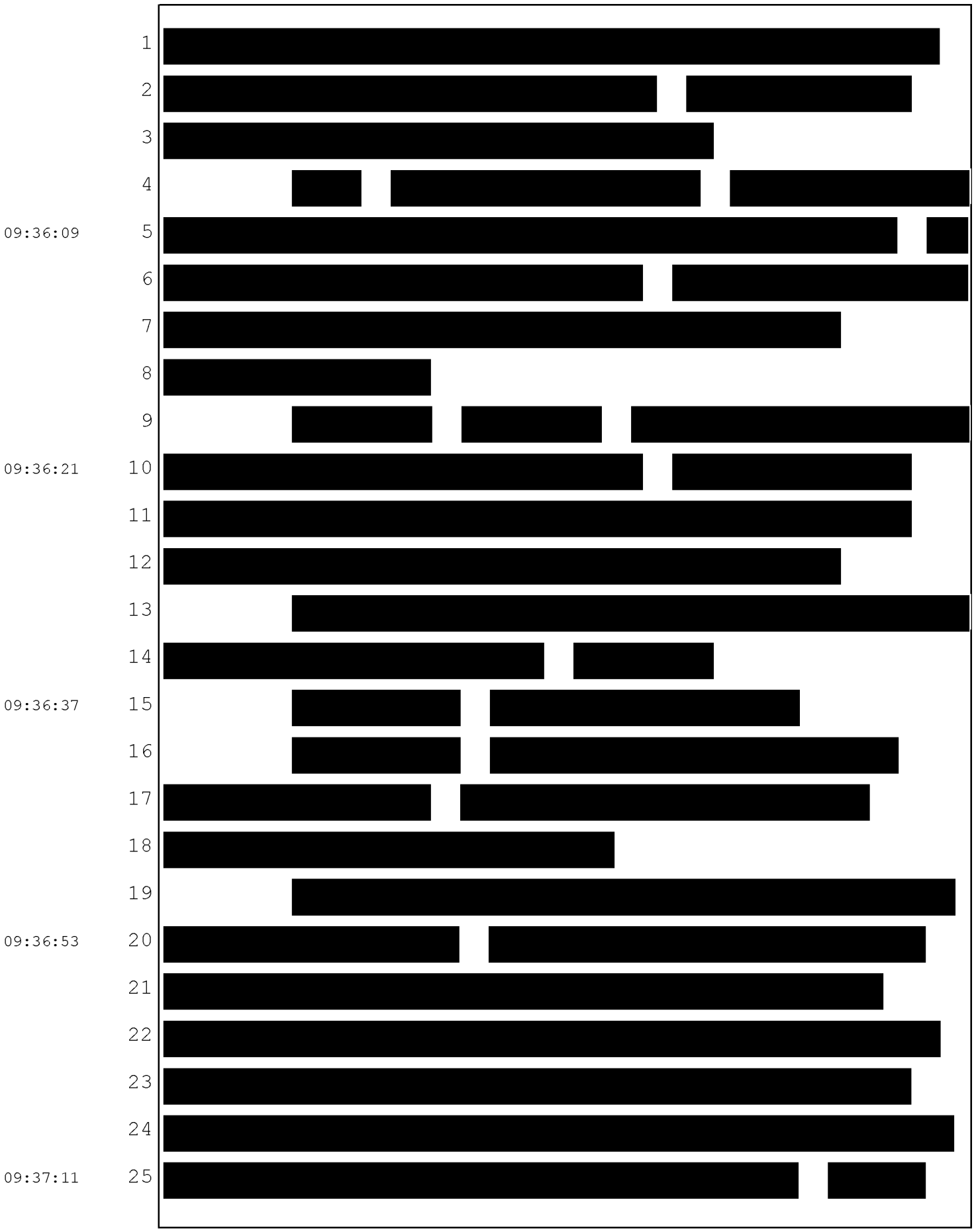
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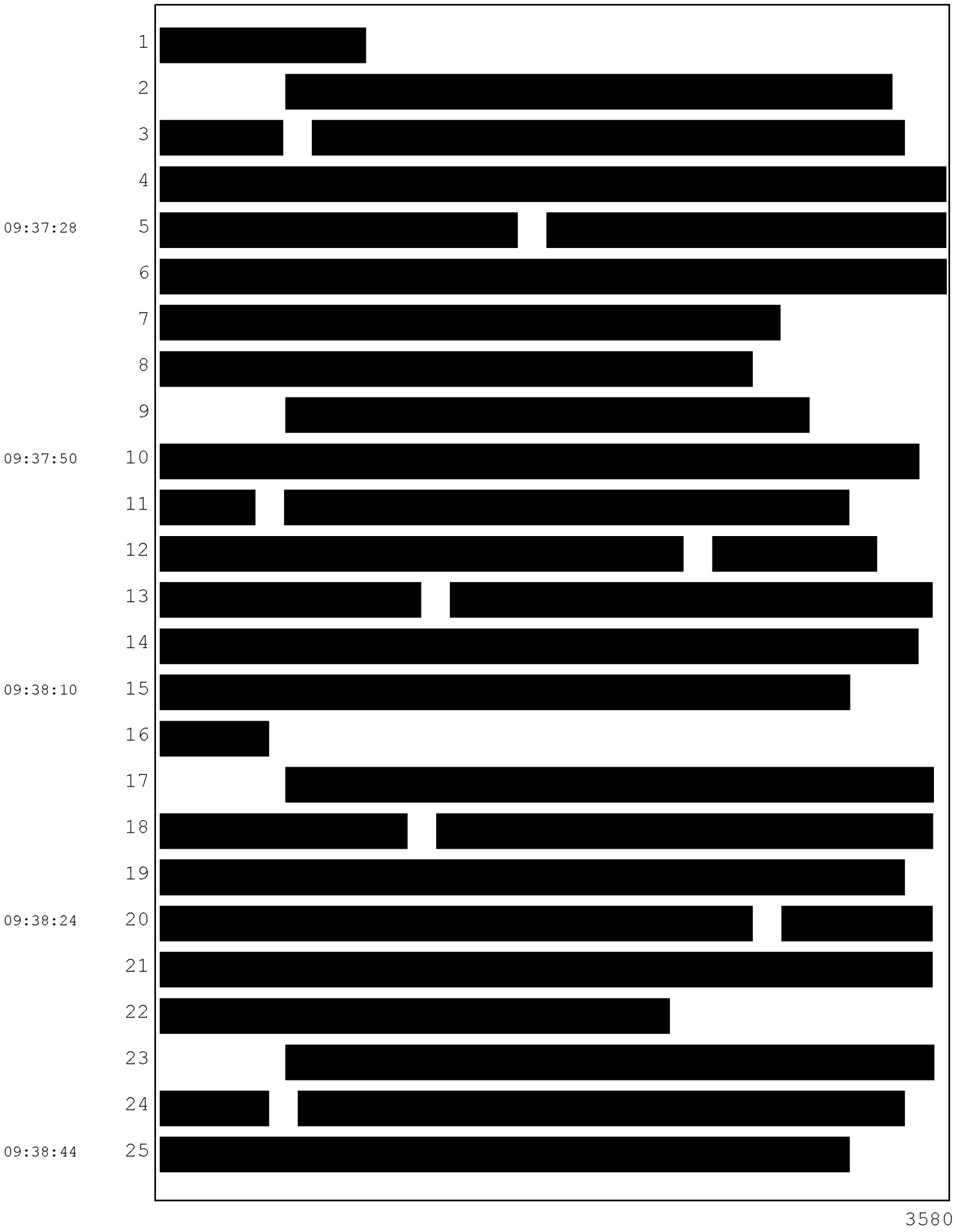
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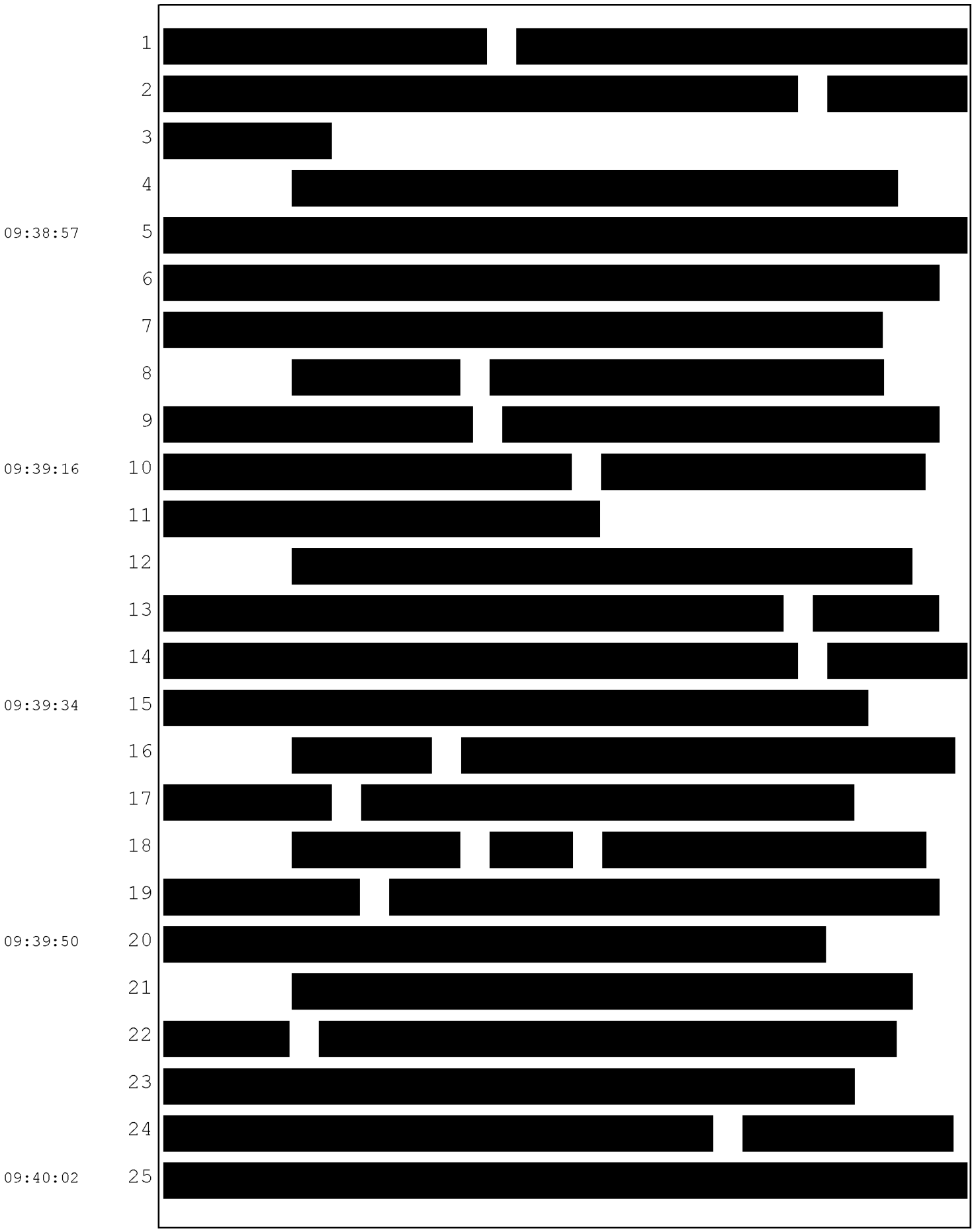
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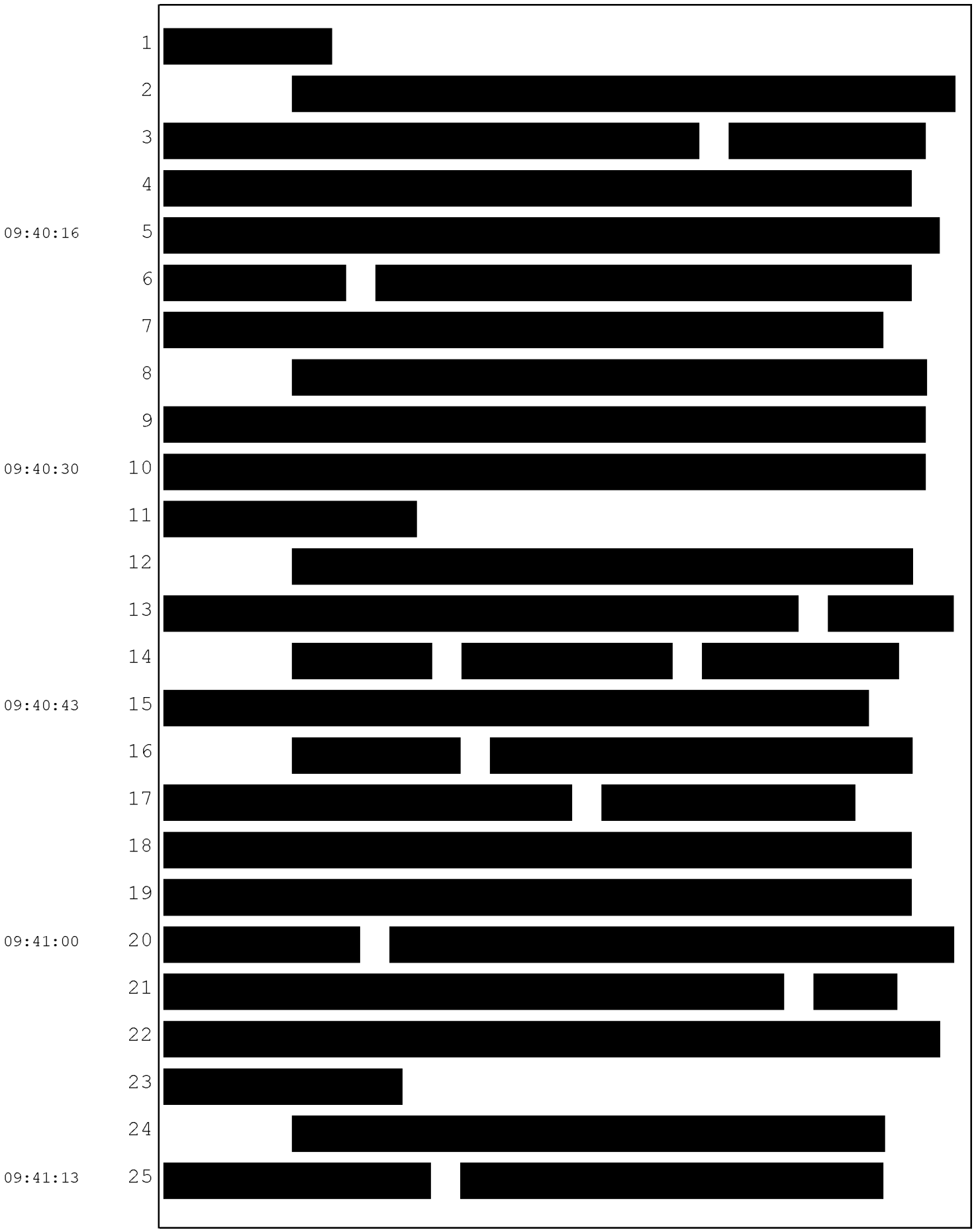
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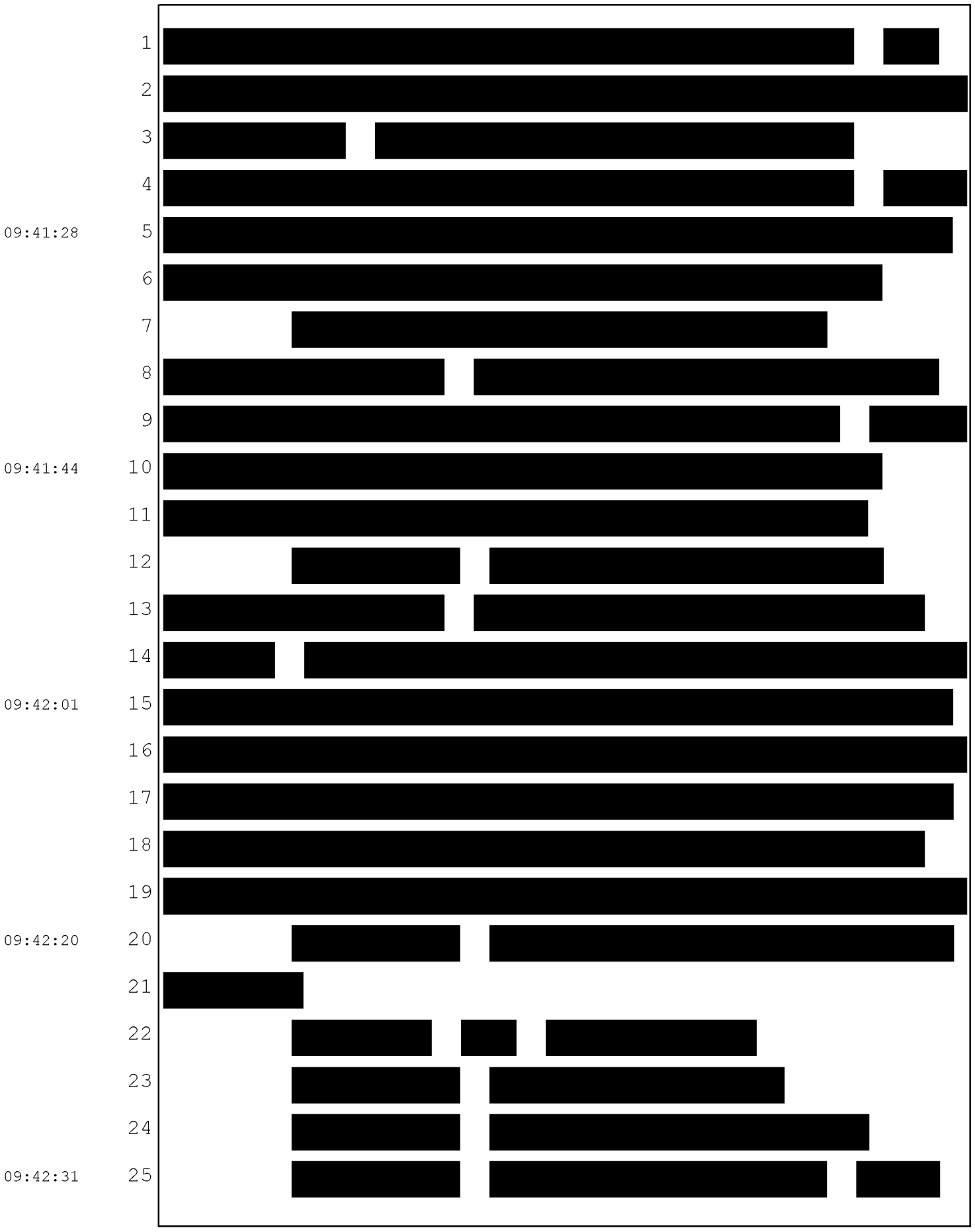
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[redacted]

(Interruption in proceedings.)

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

Mr. Dickens, you may call your next witness.

MR. DICKENS: Thank you, your Honor. At this time, plaintiff's call Dr. William Sawyer.

THE COURT: Good morning, Dr. Sawyer. Please step up here to the witness stand and remain standing

while the clerk swears you in.

THE WITNESS: Good morning, your Honor.

THE COURT: Good morning. Please remaining standing, and the clerk will swear you in.

WILLIAM ROBERT SAWYER,

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

09:52:02 THE CLERK: Would you please state and spell your name for the record.

THE WITNESS: William Robert Sawyer, S-A-W-Y-E-R.

THE COURT: Thank you.

09:52:15 You may proceed, Mr. Dickens.

MR. DICKENS: Thank you, your Honor.

DIRECT EXAMINATION

BY MR. DICKENS:

09:52:18 Q. Good morning, Dr. Sawyer.

A. Good morning.

Q. Can you please introduce yourself to the jury, and tell them something about yourself?

A. Yes. You heard my name. I am a toxicologist. 09:52:28 My training is from a medical school in -- specifically

in toxicology. I've been practicing nearly 30 years.

Q. And you mentioned medical school. Where did you go to medical school?

A. Indiana University School of Medicine with a Ph.D. in toxicology. And I trained under the late Dr. Forney.

09:52:46

Q. When did you graduate from medical school?

A. I graduated from IU in 1988.

Q. And prior to graduating medical school, you actually obtained a Master's; is that correct?

09:53:01

A. Yes. I have a Master's degree in cellular and molecular biology from State University of New York, Geneseo.

Q. And after graduating medical school, you said you got a Ph.D. in toxicology; is that right?

09:53:16

A. That's what I -- I went through a Ph.D. program through the medical school in -- specifically in toxicology, which included the first three years of medical school course curriculum, along with specific training in toxicology. It was also training in the State Department of Toxicology, as we handled all the autopsies and deaths for the State of Indiana.

09:53:31

Q. We've talked a lot about this case and heard from witnesses who are toxicologists. Can you explain to us what is toxicology?

09:53:47

A. It's a very specific field. We are the ones who determine causation, what chemicals, pharmaceuticals, environmental substances can do to the body. And physiologically and mechanistically how they operate.

09:54:03 Q. After graduating with your Ph.D. in toxicology, what did you do next in your career?

A. I worked for five years as a governmental toxicologist in Syracuse, New York. I was responsible for assessing the environmental exposures, forensic

09:54:21 matters, in general Public Health. Everything from lead in water to hazardous chemicals from, I think, almost 18 different Superfund sites in the area.

Q. You said that was through the Department of Health?

09:54:39 A. Yes.

Q. After -- how long were you with the Department of Health?

A. Five years. And during that time, I started consulting and developed my own consulting business in, I

09:54:48 think, 1990, which I am still with today.

Q. Okay. And what's the name of that consulting business?

A. Toxicology Consultants and Assessment Specialists, LLC. And I do work throughout the US and

09:55:02 also internationally.

Q. And from 1990 to the present, you've had that sole business as a toxicology or consulting toxicologist; is that right?

A. Correct.

09:55:12 Q. And you said "consulting." Who do you consult with in that role for your actual business?

A. Civil matters, which about -- 60 percent are plaintiff, about 40 percent defendant. Also a number of governmental agencies, the United States Attorney's

09:55:29 Office, US Navy, various prosecutors, Attorney State General of Montana, New York, New Jersey and other states.

Q. So you said both plaintiffs' and defendants' side. Have you ever served as an expert for a

09:55:44 manufacturer?

A. Many times. And currently.

Q. So it's not just on the plaintiff's side of claiming a chemical caused an injury. You've also served as an expert for the defendant saying it didn't?

09:55:58 A. Oh, yes. I have some very good defense experts who have true, good defense cases. I'm very selective in what cases I take.

Q. Now, there's a term "forensic toxicologist." Are you a forensic toxicologist?

09:56:11 A. Yes, I am.

Q. Can you explain what a forensic toxicologist is?

A. My training was in forensic toxicology. Forensic toxicology is simply application of science to the law. The word "forensic," the Latin root stems from debate, as we are debating today. This is a forensic matter.

Q. And so, you know, based on that, you're involved in a lot of cases, both civil and criminal; is that fair?

A. That's correct.

Q. And so you've probably done this a lot, depositions and trial testimony. Is that fair?

A. Yes. When I looked at my list of cases and trials, I testify in court, in trials, about six times per year on the average.

Q. And, once again, that's both for plaintiff and defense side?

A. That's correct.

Q. Other than your work for the Department of Health that we talked about and your own company as a forensic toxicologist, what else have you done in the field of toxicology?

A. I've served as a peer-reviewer for the Forensic Examiner, which is a peer-reviewed journal. In the past, I've directed various laboratories as a licensed lab director in multiple states, including clinical, forensic

and environmental analyses. And probably other things, but I don't have my CV in front of me.

Q. That fine. You mentioned a laboratory director. Who were you a laboratory director for?

09:57:33 A. Oh, for Express Laboratories in Rochester, New York, Public Health Laboratory in Syracuse, New York, Lozier Laboratory in Rochester, New York. Possibly others.

Q. Are you Board-certified in anything?

09:57:52 A. Yes. American Board of Forensic Medicine in 1996, I believe.

Q. Do you also teach in the field of toxicology?

A. Yes. I've taught medical students at the State University of New York, Upstate Medical Center in

09:58:09 Syracuse for, I think, 22 years, as an adjunct assistant professor in the Department of Medicine.

I specifically taught a portion of the clerkship toxicology course, as well as a portion of the second-year students in Public Health.

09:58:31 Q. With respect to -- you mentioned in your work, you know, both in your actual business and otherwise, you've worked for government agencies. What have you been doing for those government agencies?

A. Oh, a wide variety of cases. I've worked in

09:58:49 criminal cases, in terms of cause of death from

intentional poisoning with arsenic thallium. In fact, the movie was produced on my original work in 1993 called "The Black Widow."

I've worked on prosecution cases involving drugs and alcohol, which are quite common. I've worked on large chemical case matters, worked on the BP Oil release. There's just numerous cases.

Q. Have you, in the cases you've worked on, established causation analysis for chemicals or pesticides?

A. Yes.

Q. How often have you done a chemical analysis with respect to causation for chemicals?

A. Really, continuously since the last -- about the last 30 years. That's how I started in the Health Department.

Q. Have you ever published in any peer-reviewed journals?

A. Yes.

Q. How many?

A. Not a lot. Maybe -- probably about 8 or 10 original articles. And then probably about 25 review articles.

Q. With respect to those articles, those are in the field of toxicology?

A. Yes.

Q. In some of the cases you've worked on, have you ever done anything with respect to 911 and the World Trade Center?

10:00:18 A. Oh, yes. I was called on that shortly after it occurred and wrote a report, which was very extensive, including all of the chemicals that were released, including volatiles, such as benzene, even dioxin. And probably nuclear aromatic hydrocarbons and other

10:00:45 carcinogens, which led to a much broader investigation ultimately.

Q. In your work, have you ever been involved in preparing product labeling or material safety data sheets?

10:01:01 A. I'm sorry, I didn't quite hear that.

Q. Yeah, no. I'm sorry. I'll be louder for you.

Have you ever been involved in -- in product labeling or material safety data sheets?

A. Oh, yes. I have prepared material safety data

10:01:11 sheets for corporations, yes. And product labels as well.

Q. And can you tell us a little bit about that? You know, what type of corporations were these?

A. Well, one -- the first one I ever did was a --

10:01:25 actually, a corporation that made a bookbinding spray for

libraries. And, unfortunately, their original spray had carbon tetrachloride in it, which is a very dangerous liver carcinogen. And then they had switched to a chemical, which was highly volatile. And I actually
10:01:47 remember doing a flame test with it. I could shoot a flame about 10 feet with it. And they reformulated. And then I wrote a material data safety sheet and label for that product, which is still in use.

Q. And --

10:02:01 A. Using a non-flammable propellant. Because it was designed for use in close quarters, in offices and closets.

Q. And what was your particular role in that process?

10:02:17 A. Safety. I had to be certain that a number of characteristics were met, that the international guidelines for safety were met in terms of warnings for each of the chemicals in the product.

And, also, with respect to the label -- labels
10:02:37 are interesting. You actually have to have labels in a certain format of certain size, letters and displays that are easily understood and read. And there's actually standards for this. There's a big volume of documents which we use to write labels and material safety data
10:02:55 sheets that follow strict guidelines.

Q. And who ultimately is responsible for the warnings in the product labeling?

A. Well, the manufacturer.

MR. DICKENS: At this time, your Honor, we'll tender Dr. Sawyer as an expert in toxicology, forensic toxicology and exposure assessments.

10:03:05

THE COURT: Any *voir dire*?

MR. LOMBARDI: No objection, your Honor.

THE COURT: All right. Very well. Then I will accept Dr. Sawyer as an expert in toxicology and forensic toxicology and related assessments.

10:03:16

You may proceed.

Q. BY MR. DICKENS: Okay. Doctor, you're here today in your role as an expert; is that right?

A. Yes.

10:03:27

Q. And you've reached some opinions in this case?

A. Yes, I have.

Q. And the opinions that you're going to be expressing here today, do you hold those to a reasonable degree of scientific certainty?

10:03:39

A. Yes.

Q. And did you review your role in this case from the experience of a toxicologist?

A. Yes.

Q. And did you reach an opinion to a reasonable

10:03:49

degree of scientific certainty that Roundup and Ranger Pro can cause non-Hodgkin's lymphoma?

A. Yes. I have been following the peer-reviewed literature on glyphosate since mid-1990s.

10:04:06 Q. And what is the opinion you've reached, generally?

A. That, clearly, glyphosate and with its combinations of adjuvants, is a known carcinogen.

Q. You just used the word "adjuvants." Can you

10:04:23 tell us what that word means?

A. Well, glyphosate is the -- the primary -- the principal ingredient in Roundup and Ranger Pro. And glyphosate is roughly 41 percent of the product in Roundup and about 51 percent, I believe, in Ranger Pro.

10:04:46 However, there are additional chemicals and chemical -- what we call reactants, by-products, within the Roundup and Ranger Pro. It's not just glyphosate and water.

Q. There is water in Roundup and Ranger Pro; right?

10:05:06 A. Right. But there's more than just water in glyphosate.

Q. And we'll get to some of those in just a little bit. But did you also reach an opinion, to a reasonable degree of scientific certainty, that glyphosate

10:05:19 formulations have a greater potential to cause cancer

than glyphosate alone?

A. Yes, I did. Yes.

Q. And what is that opinion?

A. That glyphosate, based on animal test data, is carcinogenic by itself. However, there are additives to the product which increase and enhance its carcinogenicity by several mechanisms.

Q. And one of those that we'll talk about is surfactants; is that correct?

A. That's correct.

Q. Okay. And those are your general opinions. Did you also look at Mr. Johnson's case specifically?

A. Yes, I did. In fact, I early on interviewed Mr. Johnson by telephone.

Q. And did you reach an opinion, after your review of this case, as to whether or not Mr. Johnson's Roundup and Ranger Pro exposures substantially contributed to his diagnosis of non-Hodgkin's lymphoma?

A. Yes.

Q. And what is that opinion?

A. That Mr. Johnson, and I'll explain in detail when asked, was heavily exposed, far more than the individuals in the Monsanto UK POEM studies, for example. He was heavily exposed. He had a wet face. He had exposures in which he was notably damp or wet with the

material. And his --

Q. And based -- I'm sorry.

A. -- and his use of the product was extraordinarily heavy, approximately 50 gallons per hour.

10:07:04 Q. And is that a lot?

A. Yes. Backpack sprayers put out between 4 and 24 gallons per hour, on the average about -- about 16 gallons per hour, and he was spraying at 50 gallons per hour through a rigged system, which operated at an

10:07:23 uncontrolled pressure. It was either on or off.

Q. And you know, based on Mr. Johnson's testimony, you understand, you know, he had roughly a 50-gallon tank he'd been spraying out of, is that what you're basing that 50-gallon number on?

10:07:43 A. Right. And that he -- he actually would go through as much as 150 gallons of this stuff in one day.

Q. Can you -- you mentioned Mr. Johnson and speaking to him, can you tell us what types of materials you reviewed before reaching your opinions in this case?

10:07:56 A. Certainly. I initially reviewed a very large quantity of medical records on Mr. Johnson from -- some records dating prior to his diagnosis and then up at his diagnosis, including pathology results in August of 2014, and then his treatment records.

10:08:27 I also reviewed several of his depositions.

When I say "several," there was a Worker Comp deposition, and I believe there were two depositions following that. I also reviewed -- I had a file box, a full file box, of studies that I reviewed, which would be approximately 10:08:48 5,000 pages. I brought with me today what I could handle on the airplane, which is a good amount of material, but just a variety of documents also from Monsanto, in fact, memorandums, emails, official documents, including reports that were issued by Monsanto.

10:09:15 Q. You mentioned studies, were those both published studies and internal Monsanto studies?

A. Yes. When I say "studies," my large file box is primarily published studies from the generally accepted period of the literature, but I also have a large volume 10:09:31 of inhouse studies from Monsanto, many of which were never provided to the EPA or any regulatory agency.

Q. Those studies, were those both epidemiological studies and the animal studies that you reviewed?

A. Primarily the animal studies or the -- what we 10:09:51 call the *in vitro* studies.

Q. And -- did what did those studies entail? Did you review any studies with respect to exposure of individuals or animals to Roundup and how that affects carcinogenicity?

10:10:07 A. I certainly did. The key studies that I

reviewed with respect to exposure were actually Monsanto-published studies.

Q. You mentioned some internal correspondence, emails, other types of documents with Monsanto. Are those documents you reviewed and relied upon in reaching your opinions?

A. Yes.

Q. And these documents that you reviewed, the internal documents for Monsanto, are those types of documents that are reasonably relied upon by experts in your field as a toxicologist?

A. Yes. All the time, yeah.

Q. And what do you mean all the time? How do toxicologists rely on that information?

A. Well, a toxicologist is sort of like a detective. Okay. We look hard and deep to try to find all the evidence we can, whether it is helpful for the client or adverse to the client. It doesn't matter. The objective is to look at every possible piece of evidence and then assemble it into a conclusion based on the merit of that evidence.

Q. And is that what you did in this case?

A. Yes.

Q. And what in particular were you investigating?

A. A number of factors. To start with, the

exposure dose, which was very thoroughly calculated by Monsanto in their operator exposure studies.

Q. And can I just stop you right there. Can you define what "exposure dose" means?

10:11:50 A. Yeah. Okay. Exposure is, in this case, how much material gets on the body. Okay. The dose, however, is how much gets into the body, in the systemic circulation or into the tissue target, so there's a big difference. If, for example, the dermal absorption was

10:12:12 only 1 percent, only 1 percent of that material would make its way to the target organ, whether it be the dermis, the skin or the liver or internal organs, that's what we call the internal dose.

Q. Is that also referred to as systemic dose?

10:12:26 A. Yes.

Q. So systemic or internal, it means the same thing?

A. Yes, yeah. It means -- the bottom line is the target organ.

10:12:35 Q. And so you were discussing what you were investigating in this case, and so one of the first things you did was investigate all of the materials to try to figure out exposure and internal dose; is that fair?

10:12:47 A. Yes. The first step was to determine whether

Mr. Johnson was significantly exposed, that is, did the exposure at work actually make it into his systemic circulation? Did it make it into the blood and impact any of the stem cells that ultimately developed into a T-cell lymphoma? So really the question for Mr. Johnson was: Was he significantly exposed, and if so, was that exposure dose substantial and significant enough to cause damage to his stem cells.

10:13:13

Q. And based on your experience, education, review of all of the materials, you reached an opinion that, in fact, it was enough of an exposure dose to cause his non-Hodgkin's lymphoma?

10:13:36

A. Much so.

Q. Now, to be clear, Doctor, you don't believe that Roundup or Ranger Pro needs to be taken off the market for all purposes; correct?

10:13:56

A. No. If there were proper warnings, if an individual knew that they were dealing with a carcinogen and it was used in a limited fashion without producing what we call aerosol, that is aerosol that drifts and gets all over the body, it could be used.

10:14:11

Q. And, in fact, like many people here in this room, you've used Roundup; correct?

A. I believe it is fairly popular.

10:14:27

Q. And what do you mean by that?

A. Well, I think it's used both over the shelf. You can buy it at Walmart or Home Depot. I buy it at the Bailey's Hardware Store in Sanibel, Florida.

Q. And so you believe that Roundup and Ranger Pro could potentially be used properly; correct?

10:14:44

A. Yeah. There is a proper way of using it, yes.

Q. Okay. And so do you take any precautions in your use of the Roundup?

A. Yes. I've used it several times per year. The first time I ever used it was about 20 years ago, and I was absolutely disgusted, because I had bought a backpack, and I used it on spot weeds, and the wind blew it all over my legs. I immediately washed with soap, and I actually went into my swimming pool after that and --

10:14:56

10:15:16

Q. And why did you do that?

A. Well, because it produced an aerosol mist that the wind would uncontrollably blow back on the body.

Q. Did you try to prevent that drift?

A. I sure did.

10:15:27

Q. Okay. But you weren't able to?

A. No, I did. I drilled with about a 30-thousandths drill into my orifice in my workshop and turned it into, basically, a squirt gun, where I can directly squirt weeds. I have mulch. I don't have grass, and I have -- occasionally I have weeds shoot up

10:15:45

in that mulch, and I can direct it right on those weeds with no aerosol production, and I wear heavy rubber gloves, and I have zero exposure.

Q. Okay.

10:15:59 A. So, I mean, the -- I think that -- I don't think that the material necessarily needs to be completely banned, but there are a lot of things we use that are dangerous, but it's a matter of how you handle it and the warnings.

10:16:09 Q. Okay. And so you -- you made that modification to the actual hose. Was that after your first time of spraying?

A. Yes.

Q. And was that because of your first experience

10:16:18 with the drift?

A. Yes. And I knew at that time it had carcinogenic potential.

Q. So you had already known that?

A. Yes.

10:16:27 Q. And did you take that into consideration in your choice to use it?

A. I did.

Q. So you actually made the choice, you had the choice whether or not to use the product?

10:16:36 A. Yes.

Q. How much -- you mentioned your use. How large of an area are you actually spraying?

A. Well, I have nearly an acre, but as I say, it's almost 100 percent mulch. I don't have grass, but I do get occasional weeds.

10:16:56

Q. How does your exposure, when you do that, how does that compare to Mr. Johnson?

A. Mr. Johnson was using a higher pressure system, which was on or off. He had no controls to reduce it, and he was, based on his testimony, as I understand, about 50 gallons in an hour, which is several times what would normally come out of a --

10:17:16

MR. LOMBARDI: Your Honor, may we approach?

THE COURT: Yes.

10:17:37

(Sidebar.)

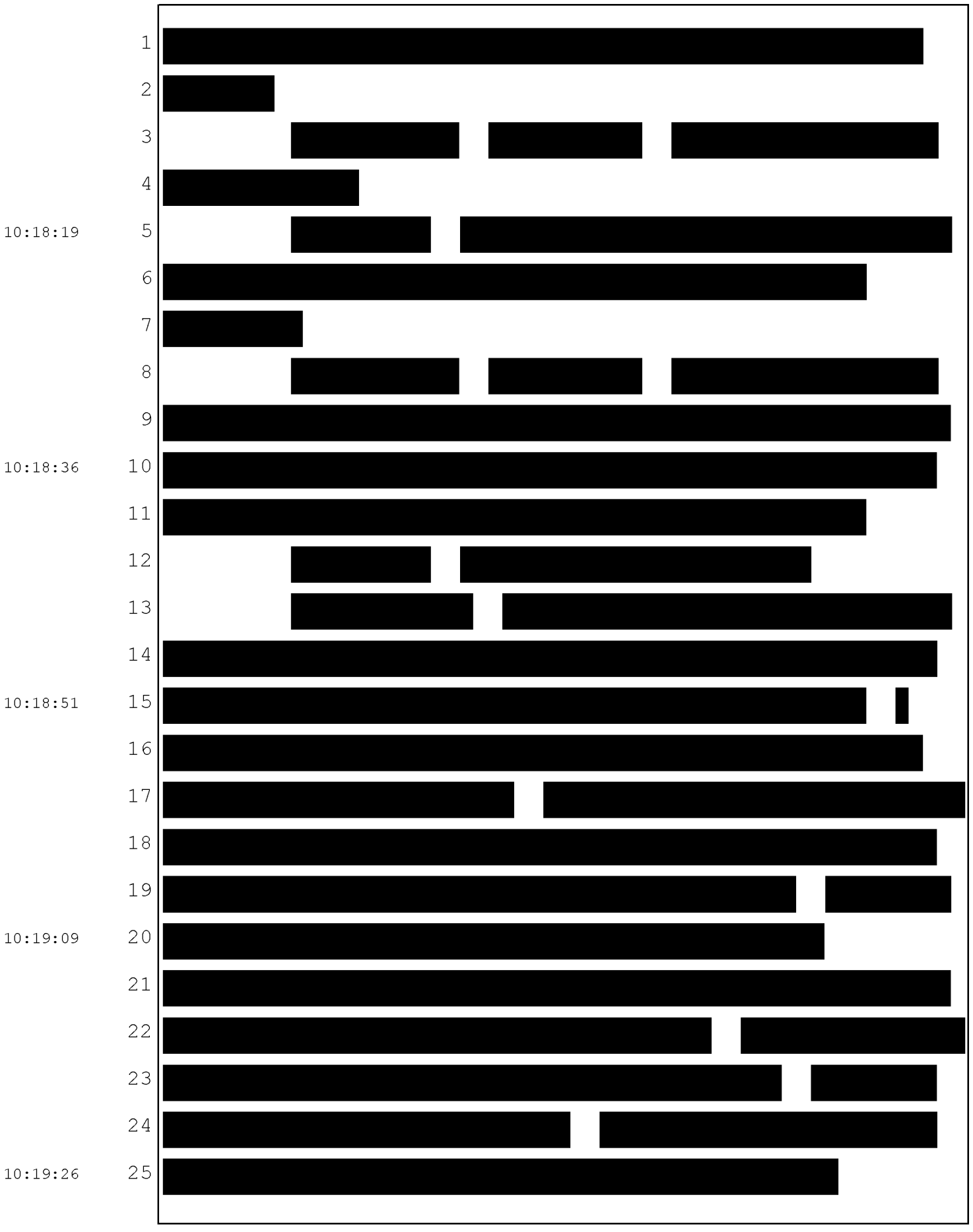
[redacted]

10:17:57

[redacted]

10:18:09

[redacted]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(End sidebar.)

THE COURT: You may continue, Mr. Dickens.

Q. BY MR. DICKENS: Okay. Dr. Sawyer, we were just discussing how your exposure compared to the exposure of

10:20:04 Mr. Johnson. Can you explain to us, again, how that -- your exposure in your one-acre yard compared to Mr. Johnson?

A. Well, what I explained was I experienced what we call drift. That's aerosol droplets that the wind blows

10:20:18 back onto the body. Now, I never experienced any drift above my knees, but Mr. Johnson experienced drift that -- in fact, to his entire body, including even face. And he was using an application rate about three times above that which is that which was used in the Monsanto

10:20:43 operator exposure assessment study. Thus, his exposure from the standpoint of the dose I relied on from the Monsanto study was severalfold higher than that.

Q. And so, you know, based on that, once again, you believe that there's appropriate uses for Roundup or

10:21:10 Ranger Pro, if used in small quantities?

A. Yes, with appropriate warnings and the proper equipment.

Q. And because you were aware of the carcinogenicity potential of Roundup and Ranger -- or Roundup when you used it, you were able to take that into consideration?

10:21:24

A. Yes. I'm an extreme outlier. I mean, I've been following -- I looked at the original hairy cell leukemia studies back in the '90s. I've been following it for years. I know what it does. That's why I was rather disgusted when I got it on my lower legs.

10:21:38

Q. And that's why you immediately stopped, went, washed it all off and got in the swimming pool?

A. Yeah.

Q. Now, what type of glyphosate products did Mr. Johnson spray, based on your understanding?

10:21:53

A. Primarily, he initially worked with what we call Roundup, which is 41-percent glyphosate, with a number of other chemicals in it, and then later, he worked more often with Roundup, which is basically the same mixture, but simply a higher concentration, 51 percent -- or 52 percent versus 41 percent in the Roundup.

10:22:15

Q. Other than the concentration, is there any difference between Roundup that you can buy in stores that ordinary consumers like us and the Ranger Pro that

10:22:35

Mr. Johnson used?

A. No. The concentration is the difference. Now, if you were to go to Home Depot or Lowe's, you would find that there's Roundup and -- which they call Roundup Concentrate, and there's also a Roundup Super Concentrate, which is 51 percent, and the instructions simply -- state simply dilute it more when you buy the Super Concentrate, so it's basically the same material.

Q. Does Monsanto sell glyphosate by itself?

10:23:20 A. No. However, they license it to other corporations, such as Syngenta and a number of other corporations, but they don't sell it to consumers as pure glyphosate, no.

Q. Monsanto -- is Monsanto the manufacturer of both

10:23:39 Roundup and Ranger Pro?

A. Yes.

Q. Did Mr. Johnson use any glyphosate formulations by any other manufacturer?

A. Not that I found in the records or his

10:23:50 deposition.

Q. And was Mr. Johnson ever exposed to any other chemicals, pesticides or herbicides that had been associated with non-Hodgkin's lymphoma?

A. Not to my knowledge, no.

10:24:02 Q. And you reviewed that, his chemical exposure;

correct?

A. That's correct.

Q. You mentioned, kind of, the makeup of Roundup and Ranger Pro, and you said water and glyphosate and some other stuff. What are some of those other chemicals?

10:24:14

A. Well, propylene glycol. Propylene glycol is used to help emulsify the material. Remember, the product works by gaining entry into the plant leaf, and the absorption of that chemical into the plant leaf is very critical in terms of operating and knocking out the ES -- or the EPSP enzyme, which permits plant growth in light.

10:24:36

So some of these additives, propylene glycol, dipropylene glycol, tallow amine, which is what we call a POEA, a polyethoxylated ethyl amine, are all used to help the penetration of the product either spread onto the leaf or penetrate into the leaf and work more efficiently. It's a very clever design, really, in terms of how this product works.

10:25:01

10:25:30

And so there are also what we call co-contaminants that -- for example, when the POEA is made, whether it's tallow amine or another POEA, there's oxidation reactions in preparing that, which result in ethylene oxide, 1, 4-Dioxane, and those two chemicals are

10:25:50

known confirmed Class A human carcinogens. In fact, ethylene oxide is one of the most potent carcinogens known to man, and it's highly volatile, so when it is used -- whenever ethylene oxide is present, it's volatile as it's inhaled.

10:26:12

So there are co-contaminants. There's even some additional co-contaminants that form during the production process, called N-nitroso compounds, which are also known human carcinogens, which generally cause cancer in humans, so --

10:26:30

Q. And, Doctor -- I'm sorry.

A. Yeah, I mean, it's a mixture of adjuvants, surfactants, glyphosate, and then trace quantities of these other carcinogens, which act in an additive and in some cases synergistic effect to cause cancer, along with glyphosate.

10:26:51

Q. You just mentioned surfactant. We've heard some of that here in this case so far. What is a surfactant?

A. Well, a surfactant is -- think of -- think of water on a freshly waxed car and the water droplets bead up. If you were to add surfactant to that rain water, it would spread out over that waxed car, and a surfactant is -- in a sense, it's a detergent. It's a soap. But in this case, they generally use what we call non-ionic surfactants, but the fact is the surfactant is simply

10:27:10

10:27:35

allowing a reduction of the hydrophobic to hydrophilic repellant and allows the material to spread out evenly over the leaf or the human tissue.

Q. It's a fairly complicated explanation, but I think you just said it there. It helps, you know, spread out those droplets; correct?

A. Yes.

Q. And so for Roundup or Ranger Pro, those surfactants help it spread across the surface of the leaf?

A. It does. And at the same time, it also enhances permeability through the epidermis of the skin or the leaf cuticle.

Q. And so if you get it on your skin, how does -- what does the surfactant do?

A. Well, a number of things. There --

Q. And I believe -- to help us out here, I believe you have an -- or helped prepare a demonstrative with respect to what a surfactant does in a herbicide such as Roundup -- or in Ranger Pro.

MR. DICKENS: Permission to publish Plaintiff's Exhibit 36, your Honor?

THE COURT: Any objection?

MR. DICKENS: That's what I've given you.

MR. LOMBARDI: Is it the board?

MR. DICKENS: It's --

MR. LOMBARDI: I'm sure I don't. I trust Mr. Dickens.

MR. DICKENS: That's what I handed you earlier.

10:29:03 THE COURT: All right. Thank you. You may proceed.

Q. BY MR. DICKENS: And so this demonstrative, Dr. Sawyer, says, "Surfactants are able to increase glyphosate absorption through the skin by," and number

10:29:22 one is: "Removal of lipids from the epidermal surface due to surfactant action."

What is that?

A. That's a critical step. This is a detergent soap-type effect. A lipid is a hydrophobic -- let's make

10:29:40 it simpler. A greasy, oily material. It doesn't mix with water. So if you have a greasy pot or pan, and you add a little soap to it, you can -- and remove that greasy, oily film. That's what a surfactant does.

And on our skin, on our epidermal surface, we

10:30:03 have fatty acids, a number of them, and other what we call hydrophobic lipid material, which is resistant to letting aqueous material enter our epidermis. So that surfactant breaks that surface tension, emulsifies some of that material, so there's a higher likelihood of the

10:30:26 water soluble drug, in this case glyphosate, to enter.

Q. You just mentioned soap, and some Monsanto witnesses have essentially said surfactants are soaps or liquid detergents or laundry detergents. Is that your understanding as well?

10:30:44 A. That's -- that's true. It's a little bit of a crude definition, but yes.

Q. Okay. And so, you know, just like that soap, you know, can help, kind of, with the actual epidermis, can you explain how does the surfactant in Roundup

10:31:04 compare to what's in soap? Is it the same thing?

A. It's a non-ionic surfactant, largely. There are several surfactants used.

Q. And that's in Roundup?

A. Oh, yeah. In Roundup primarily is tallow amine,

10:31:18 which is a POEA. That is a very powerful surfactant, and it also has some very serious toxicological consequences associated with it.

Q. Are POEAs used in soap or laundry detergent?

A. Not to my knowledge. Used for industrial

10:31:39 cleaning of tanks, I know.

Q. Okay. And so for the POEA, you said it has some toxicological consequences. What are some of those toxicological consequences of POEA?

A. Primarily, once it becomes systemic, it has been

10:31:57 shown to induce what we call DNA adducts, that is the

DNA, the molecular code material in our body, in our cells, which determine whether we produce normal skin or carcinogenic skin. That DNA can be damaged by what we call these adducts, that is the binding of the POEA, the tallow amine, to the DNA, and when the DNA is read, it is misread and becomes corrupted. There's also oxidative damage done to the DNA from tallow amine and other POEAs.

Q. Has Monsanto ever conducted any carcinogenicity studies on the surfactant such as POEA?

A. No, they have not.

Q. Has the EPA ever reviewed the carcinogenicity of surfactants?

A. No. No. I've researched that. The only thing EPA has done is what's called an SAR, a structural activity relationship by computer.

Q. And what is that? Can you explain it? You say by computer. How do they test that? How does that related in any way to carcinogenicity?

A. Well, there are certain classes of compounds that are generally carcinogenic. For example, let's take chlorinated hydrocarbons, such as trichloroethylene, TCE, or DDT or dioxins or PCBs. They're all chlorinated hydrocarbons, and they have certain chemical configurations with chlorine that are very often carcinogenic.

So by performing an SAR analysis, one is simply looking at the configuration of the chemical. In this case, it's an organic phosphate. It's not a neurotoxic organic phosphate, but it is an organic phosphate, and the SAR did not find that chemical to be -- likely to be carcinogenic. That is the EPA position.

10:33:55

Q. Okay. And so that's based on a computer model, but they haven't actually looked at any testing as to carcinogenicity?

10:34:09

A. No, it's never been tested.

Q. And has Monsanto ever submitted any testing at all with respect to the carcinogenicity of their surfactants?

A. No. However, Monsanto has documented and recommended that such evaluations be performed. That's very clear.

10:34:24

Q. And did they ever perform them?

A. No. What has been performed are university studies showing, you know, the DNA adduct formation and DNA oxidative damage. That's been published in the peer-reviewed scientific literature.

10:34:43

Q. Okay. And so Monsanto themselves never conducted any testing, but you mentioned universities. So those are third parties?

A. Correct.

10:34:54

Q. And those third parties have tested the carcinogenicity of surfactants?

A. Only the DNA aspects.

Q. And going back to our demonstrative, increase the hydration state of the skin under closed exposure conditions, what do you mean there, Doctor?

A. That is simply the effect, for example, that skin cream would have by keeping the skin moist, less apt to dry out and become less permeable.

Q. Number three, I think we've already talked about. It increases the skin contact; correct?

A. Correct.

Q. And then number four, what do you mean by number four?

A. This -- this is very important to plants, not as important to humans.

Q. Okay. And let's move on to number 5. How does number 5 apply to humans?

A. Very critical.

Q. And how?

A. Well, glyphosate is generally accepted, widely known, and even as per Material Safety Data Sheets produced by Monsanto, is a skin irritant. I don't think there's any debate about that from Monsanto or anyone. It does irritate the skin. It can cause redness of skin,

and that redness of skin, that's an irritant effect. Whenever skin is irritated, inflammation occurs and there's dilation of the dermal capillaries and blood vasculature. That's what causes red skin. It's just a simple fact. It's a skin irritant.

10:36:35

Q. And once the skin then becomes irritated in any way, does that affect the amount of absorption into the skin of the product?

A. Heavily. When vasodilation occurs in the dermal layers, dermal absorption is increased.

10:36:53

Q. So if you have any damaged skin at all, you said dermal absorption of the actual Roundup or Ranger Pro increases for a human?

A. Yes.

Q. And what role does that play in non-Hodgkin's lymphoma?

10:37:06

A. Well, it increases the dosage. In other words, if a person is chronologically being exposed and has skin irritation developing from the use of it, certainly that would increase dermal absorption in those specific areas of irritation.

10:37:27

Q. And is some of that what you're discussing in number six here?

A. That's simply an inflammation process. That does occur as well. That is not necessarily significant

10:37:45

with respect to increased dermal absorption.

Q. Based on your review of all the materials you saw in this case, is it your understanding that Monsanto agrees that the increase of -- or surfactants can

10:38:06 increase subepidermal blood flow due to irritant action of the surfactant?

A. Yes.

Q. So do you also know whether or not Monsanto agrees that Roundup and Ranger Pro can irritate the skin?

10:38:24 A. Yes.

Q. And that can increase the amount of dermal absorption?

A. Yes.

Q. Doctor, if you can turn to Exhibit 209 in your

10:38:42 binder.

A. Okay.

Q. It's a document already in evidence. It's surfactant toxicology. And if you can turn to that last page of this particular document. Let me know when you

10:39:02 get there.

A. All right.

Q. Can you please read the general conclusions included here and let me know when you're ready.

A. Yes. Simply that surfactants are biologically

10:39:16 not inert.

Q. Okay. And before you go on, after reading this, do you agree with the statements made in this particular exhibit?

A. I do.

10:39:25 MR. DICKENS: Permission to publish Plaintiff's Exhibit 209, your Honor.

THE COURT: Very well.

MR. LOMBARDI: No objection.

Q. BY MR. DICKENS: And is it your understanding 10:39:39 that this is a document prepared by Monsanto?

A. Yes, it is a Monsanto document that was prepared as a slide presentation.

Q. And that's based on your review of, you know, the first document, I guess, or the first page?

10:39:55 A. That is correct. I reviewed that and even researched who the ex-employee was.

Q. And who was that employee?

A. That was Mark Martens.

Q. Thank you, Doctor. I want to go through and 10:40:12 have you explain what some of these conclusions mean for us.

It says, "Surfactants are biologically not inert." First of all, what is "inert"?

A. Inert is what Monsanto publishes on their label 10:40:25 of the bottle.

Q. And what does it mean?

A. They list the surfactants as an inert ingredient meaning that that ingredient is not the primary ingredient that kills the weed. So they're calling it inert.

10:40:43

However, by definition toxicologists consider inert materials such as hydrogen, water. Harmless things are inert, okay? Inert has, from a toxicological standpoint, means harmless. And what this slide states that surfactants are biologically not inert. I agree with that. That is true. They can be toxic, and this must be addressed.

10:41:06

Q. And with respect to POEA, that's once again the surfactant used in the Roundup and Ranger Pro used by Mr. Johnson?

10:41:21

A. Yes.

Q. Is the POEA, is that not inert and toxic, in your opinion?

A. It's very toxic, yes. And it's not inert. That's why Monsanto's toxicologists put this together and stated it must be addressed, and over the last 15 years or so, it has not been addressed.

10:41:34

Q. And that's based on your review, the toxicity of the surfactants has not been addressed by Monsanto?

A. That's correct.

10:41:55

Q. The second bullet point I want you to explain to us, it says, "Part of the toxicity of surfactants is related to the surfactant action which destabilizes cell membranes."

10:42:09 What is -- can you describe the process of destabilizing cell membranes? What does that mean?

A. Yes, I have an epidermal layer of the human skin demonstrative that might help. But if you want to get to that later, that's fine.

10:42:28 Q. Yeah, that's fine. We can get to that later.

We'll go to the third one. "Part of the toxicity of surfactants can be specific skin sensitization oestrogenicity. I probably pronounced that incorrectly, but can you tell us what that means and

10:42:44 whether you agree with it?

A. Yeah. The -- some of the surfactants can immunologically sensitize the skin. Some of the surfactants act in an estrogenetic capacity. In other words, as the tail of the molecule metabolizes, that

10:43:07 specific molecule is close enough to the structure of estrogen that it has a certain level of estrogenicity.

This is spelled with an "O" because it's British. It's estrogenicity.

But the problem with estrogenetic chemicals is

10:43:23 they can cause a number of developmental abnormalities

and can even stimulate estrogen positive breast cancer.

So -- and I want to be careful about this because the non-oil compounds are clearly estrogenetic, and that's not what's in Roundup and Ranger Pro. Tallow amine is in Ranger Pro and Roundup, and I don't believe that tallow amine is estrogenetic. I'm pretty sure of that.

10:43:49

So in this slide with respect to the toxicity being estrogenetic, I don't think that applies in this case.

10:44:11

Q. Okay.

A. But in terms of skin sensitization, yes.

Q. And that's helpful.

Now the fourth bullet point, "Toxicity of surfactants depends on their concentration in the formulation."

10:44:20

Do you agree with that?

A. Absolutely. Dose makes a difference.

Q. And the more concentration of surfactant in the formula, the higher the toxicity?

10:44:34

A. Yes.

Q. And then the last bullet point, "The high added value of herbicide formulations containing surfactants resides in the optimal compromise between efficacy and safety for man and the environment."

10:44:48

Once again, do you agree with that statement?

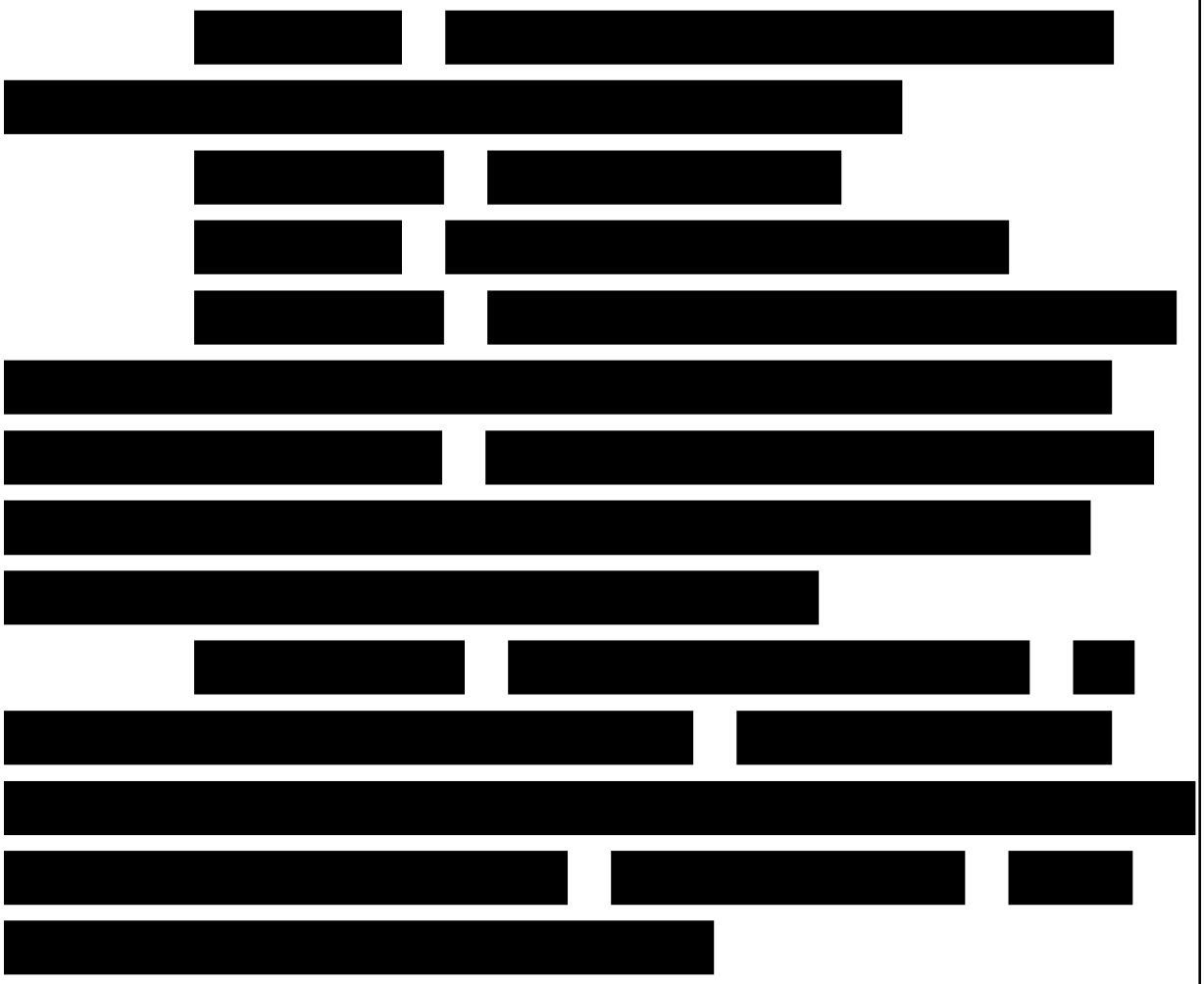
A. Absolutely, yeah.

Q. We talked some about the POEA and the toxicity of POEA. Did Monsanto ever consider whether or not to change the surfactant used in Roundup or Ranger Pro?

MR. LOMBARDI: Objection, your Honor. With this witness relating facts not in evidence and facts that this witness is not able to relay pursuant to our discussions this morning.

10:45:16 THE COURT: Can you approach, please, Counsel.

(Sidebar.)



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(End sidebar.)

THE COURT: The objection is sustained. You may ask another question, Mr. Dickens.

MR. DICKENS: Sure.

Q. Doctor, can you tell us what are the routes of exposure of Roundup and Ranger Pro to humans?

A. Most significantly, dermal to a slight extent, inhalation. And really that's the only two significant routes.

Q. And when you say "dermal," that means through the skin?

A. Yes. Yes.

Q. And inhalation is essentially breathing in the Roundup or the Ranger Pro?

A. Yeah, depending on the aerosol droplet size. And in this case, it's not very significant at all as Mr. Johnson wore a dust mask which should have captured much of the droplets.

Q. You say that a dust mask. It's your understanding Mr. Johnson wore a mask over his nose and mouth?

A. Yes.

Q. And when you say -- are you talking with respect

to inhalation, and that should have provided protection from inhaling the Ranger Pro or Roundup?

A. That's correct. The operator exposure studies have demonstrated that even without a dust mask, inhalation is a very minimal, very minimal portion of the overall systemic dose.

10:47:46

Q. And is there any other route of -- you mentioned inhalation and dermal. Those are the significant routes; is that correct?

A. Yeah, the hand-mouth activity has not been officially evaluated. It is possible among some applicators who smoke cigarettes, for example, or have a habit of touching their mouth, there could be some hand-to-mouth exposure, but that has not really been verified in the literature.

10:48:02

10:48:25

Q. So the overwhelming concern for applicators of Roundup and Ranger Pro is having Roundup get onto the skin; is that right?

A. Yes.

Q. And that's true with respect to Mr. Johnson?

A. Yes, it is.

Q. Now there's a term. Do you understand the term "AD and E"?

A. Yes.

Q. What is that?

10:48:37

10:48:51

A. Absorption of the drug. That is, how much of it makes its way into systemic circulation. The distribution of the drug, whether it goes to the liver or kidney or bone or whether it accumulates in the fat, and
10:49:10 the excretion, "E" is for excretion, how it is removed from the body, whether it goes through the urine or the feces or out in the breath. And then metabolism. That is, is the drug or the chemical altered in any way after it gets into the body. Does the liver change it into
10:49:32 metabolites or does it all just go out unchanged in the urine. That's the metabolism aspect of it.

Those are the four very important points that toxicologists study to determine the mechanism of how a drug causes potential adverse effects or injury.

10:49:49 Q. Why don't I take a step back.

With respect to the POEAs or surfactants that we discussed, generally are there safer, less toxic alternatives than POEA for herbicides such as Roundup or Ranger Pro?

10:50:03 A. Yes.

Q. And were those safer, less toxic surfactants available to Monsanto?

A. Sure. I mean, there's -- I wear contacts. Contact lens solution has non-ionic surfactants in it
10:50:25 that are harmless. I mean, there's many non-ionic

surfactants that are harmless that are used in medicine, in ophthalmology and so on. So certainly there are alternatives.

Now I can't speak on the cost on that. There may be cost factors. There may be, you know, other engineering reasons, but I can't speak on that aspect.

Q. Those alternatives for the surfactant, were those available in 2012, when Mr. Johnson began spraying Roundup and Ranger Pro?

A. Yes.

Q. Did Monsanto have other glyphosate formulations that used other types of surfactants other than POEA?

A. I'm sorry, I didn't --

Q. Did Monsanto have any other glyphosate formulations that used surfactants other than POEA?

A. Oh, absolutely, yeah. In other parts of the world, they had to.

Q. I understand you have a demonstrative to help explain how Roundup and Ranger Pro can get into the skin; is that right?

A. Yes.

MR. DICKENS: Permission to publish Plaintiff's Exhibit --

THE COURT: Mr. Dickens, perhaps before we get into this next demonstrative we can take the morning

recess.

MR. DICKENS: That's perfect.

THE COURT: All right. So we'll be in recess, Ladies and Gentlemen, for 15 minutes. And we'll resume again at five after 11:00.

10:51:55

Please remember do not discuss the case nor do any research. Thank you.

MR. LOMBARDI: Your Honor, may we approach for just one second?

10:52:04

THE COURT: Yes.

(Sidebar.)

[redacted]

10:52:20

[redacted]

10:52:35

[redacted]

10:52:54

[redacted]

(End sidebar.)

(Recess.)

THE COURT: Welcome back, Ladies and Gentlemen.

Ladies and Gentlemen, Dr. Sawyer remains under oath. And Mr. Dickens, when you're ready, you may proceed.

MR. DICKENS: Thank you, your Honor.

I can actually have Dr. Sawyer step down. And permission to publish Plaintiff's Exhibit 1042.

THE COURT: Any objection?

MR. LOMBARDI: No objection, your Honor.

11:07:05 THE COURT: Very well. You may step into the well, Dr. Sawyer.

Q. BY MR. DICKENS: Okay. Dr. Sawyer, what are we looking at?

A. Is it possible, can I use the pointer?

11:07:30 I wanted to explain -- I was asked to explain aspects of dermal absorption, that is, how does a drug or chemical, specifically glyphosate, make its way through the skin.

What this is, is the epidermal layers of the 11:07:45 skin. We are constantly producing new skin.

Q. And Doctor, can you step to the side to the rest of the jurors can see.

A. All right.

We're constantly renewing our skin. It's not a 11:08:00 long-term tissue. And what we have are what we call keratocytes that -- this is the dermal layer, the dermis. And these cells differentiate into what we call --

Q. Just so I can just -- so this is human skin. Is this essentially like the top, like if this were an arm?

11:08:24 A. This is the external layer, yeah.

So we have these keratinocytes and they differentiate into the -- as they basically move towards the outside of the skin, into a differentiated brick and mortar or layered pattern, a very tight pattern.

11:08:43 Q. And what is the significance of that pattern?

A. Well, as they -- as these cells develop and move forward, they become filled with keratin, cholesterol, ceramides, and other substances that are very lipo -- hydrophobic. In other words, chemicals that do not

11:09:10 absorb water, and they're very resistant. They're basically designed to block substances from coming in.

And they can be modified. For example, organic solvents defat these cells.

Q. What do you mean by that, Doctor?

11:09:27 A. It empties them from the cholesterol, the fatty acids, and the ceramides in these cells are depleted and removed. And then chemicals absorb very rapidly down into the dermis where the blood and circulatory system picks up the chemical.

11:09:47 Q. I thought skin was supposed to protect us from --

A. It is, but it can be damaged in several ways. Okay? Surfactants, these -- this layer of keratin into the stratum granulosum, this layer has protein in it as

11:10:04 well. It also has hair follicles.

And the proteins especially that are involved in this matrix have three-dimensional configurations. Okay? These configurations are designed to not allow substances in and yet hold the integrity of the skin together.

11:10:27 Now, if that protein is denatured with heat, for example, it can form a complete block, a complete cement barrier. If the outside of this tissue is hit with a surfactant such as tallow amine, the tallow amine can basically dampen or release the hydrophobic nature.

11:11:02 Remember I told you about putting a drop of water on the waxed surface of a car and it beads up. The surfactant can allow water-soluble material to penetrate through this hydrophobic barrier, and that's the principle of using the surfactants, is to increase the

11:11:22 permeability into a vegetable leaf.

However, the same thing holds true with the human skin, and it's well proven that the surfactants increase dermal absorption of glyphosate. Monsanto's own documents admit that.

11:11:37 Q. So the dermal absorption, does it ever -- does it ever get blocked at any level as it moves down into the skin?

A. Depends on the chemical. A chemical such as trichloroethylene, which is an organic solvent, can pass

11:11:54 through this very readily and destroy the matrix, empty

out these keratinocytes. And other chemicals such as surfactants can simply increase the ability of a watery substance, like glyphosate, which is water soluble, can increase that permeability.

11:12:13 So there are several things to keep in mind. If this protein structure that holds this matrix together is altered, that can either increase or decrease permeability depending on what it does to the protein. Surfactants can increase the permeability of a 11:12:31 hydrophilic substance such as glyphosate.

Q. So the POEA, which is the tallow amine in this case, actually helps glyphosate get into the skin and down into -- as you were saying, down into the sensory neuron and the Merkel cell; is that right?

11:12:53 A. Yeah, mainly blood vasculature, which is within this dermal area.

But the other thing that glyphosate does, which has been well documented, it changes the cytokines, which are structures that hold this together. And glyphosate 11:13:11 changes the structure of the epidermis over time.

So a person who's chronologically using glyphosate ends up with a more permeable skin.

Q. And Mr. Johnson's exposure to the Roundup and the Ranger Pro, would that have occurred with him? Would 11:13:29 it have changed the permeability of his skin?

A. Yes. That's been well documented in the peer-reviewed literature, and it's in my report.

Q. And so it's actually the Roundup formulation with the surfactant which allows that to happen; correct? It becomes more permeable.

11:13:41

A. Yes, but the glyphosate itself changes the cytokine structure that holds the integrity of the epidermis together.

Q. But without the surfactant, it wouldn't as readily pass through the skin.

11:13:53

A. Well, there's two factors. The surfactant and the glyphosate itself increases permeability over time.

Q. So the combination of the two. The Roundup formulation actually would have more permeability than glyphosate itself?

11:14:08

A. Correct.

Q. Thank you, Doctor.

Doctor, before the break you had mentioned your role in the Material Safety Data Sheets. Does IARC, which we've heard about in this case, does IARC play any role in information that's included within a Material Safety Data Sheet?

11:14:39

MR. LOMBARDI: Your Honor, beyond the scope of the report.

THE COURT: Can you approach, Counsel.

11:14:55

(Sidebar.)

[redacted]

(End sidebar.)

THE COURT: All right. Very well. You may proceed, Mr. Dickens.

MR. DICKENS: May I approach to hand the witness some water, your Honor?

THE COURT: Yes.

Q. BY MR. DICKENS: Okay, Doctor, I was asking you, does IARC play any role in the information within the Material Safety Data Sheets?

A. Yes.

Q. And how is that considered for a manufacturer in the information included in the Material Safety Data Sheets?

A. Well, under US governmental guidelines, and even international guidelines such as OECD, the IARC classification is required to be stated with respect to carcinogenicity -- carcinogenicity level in the MSDS.

MR. LOMBARDI: Your Honor, I'm going to have to renew my objection. This is beyond the scope, I believe.

MR. WISNER: I believe he stated it in his deposition. It's not beyond the scope.

11:16:49 THE COURT: Counsel, can you approach, please.

(Sidebar.)

[redacted]

11:17:03 [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

11:17:21 [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

11:17:40 [redacted]

(End sidebar.)

THE COURT: All right. Objection overruled.

You may proceed, Mr. Dickens.

Q. BY MR. DICKENS: Okay. Doctor, can you explain

11:17:58 to us how IARC is used in the preparation of Material

Safety Data Sheets?

A. Yes. All MSDSes -- that stands for Material Safety Data Sheet -- are required to provide the IARC classification of carcinogenicity, as IARC has been for many years the key agency internationally that determines whether or not a chemical is carcinogenic, and they have several classes of what we call a confirmed known human carcinogen, a probable carcinogen, a possible carcinogen, and even a class for those of questionable possibilities of carcinogenicity, and then a lowest class, which is non-carcinogenic.

Q. I want to turn back to the skin and your discussion there. You used some terms, and I'm not sure we defined those, really. You were talking about hydrophilic and lipophilic.

Can you explain what that means and how it applies to Roundup and Ranger Pro.

A. That is the -- really the key basis of dermal absorption of glyphosate. That is, if it is hydrophobic tissue, that is a fatty acid cholesterol ceramide-based keratin cell -- that's what on the very outer portion of our skin -- that's what we call hydrophobic. It repels water.

And between those cells in the integrity of that brick-and-mortar structure, which I showed you, are

proteins and cytokines that hold the matrix together, and water-soluble molecules can pass through that with surfactant. Even without it, small amounts can get through.

11:19:59 But surfactant breaks the tension, allows the chemicals that are water soluble to make its way through the matrix.

Q. And you mentioned hair follicles as well. So someone who has more hair on their arm, would that

11:20:17 actually prevent more glyphosate and surfactant to get into the skin?

A. No. The greater the number of hair follicles usually enhances dermal absorption. It's an easy path for a water-soluble molecule to take.

11:20:29 Q. So somebody who may have more hair on the skin or the chest or the back, that actually increases dermal absorption?

A. It does.

Q. Would someone in a profession like Mr. Johnson,

11:20:46 an integrated pest manager, would they tend to have more dermal absorption than someone like me who stands up here and asks you questions?

A. Yeah. So I examined that in my report, as you know, and cited numerous studies. Farmers, for example,

11:21:03 have a higher propensity of what we call skin cracks and

fissures, and it's from working with dry soils, materials, farm equipment, their hands tend to have a higher of permeability from cracking of the skin. That's been very well documented.

11:21:21 Q. How do you go about testing the actual dermal absorption of a chemical like Roundup or Ranger Pro?

A. There are several ways. One is a simple patch test on the skin of an animal in which a known quantity of material over a square centimeter of tissue is placed

11:21:46 for a particular length of time, and then the amount of material that is left on the patch or on the outside of the skin is measured. The amount that's absorbed in the body is measured through the urine and feces. And one can then determine how much made it in.

11:22:09 Another method is an *in vitro* method. That means a laboratory bench method where a Franz diffusion disk is used. The Franz diffusion disk if I had a cup, okay, and on this cup I took human cadaver skin, fresh human cadaver skin that's been recently removed and

11:22:37 refrigerated under careful control, and that human cadaver skin is then stretched over this round surface, and then another cylinder placed on the other side of it, and then the fluid in this cup I'm holding would contain glyphosate and -- a known amount of it.

11:22:56 And then the other side of the cup would include

saline at physiological pH, with a stirring mechanism so the fluid is moving, and then after a number of hours the amount of glyphosate on this side of the cup is measured versus on the other side of the cup. And that tells us how much went through the skin.

11:23:19

Another aspect to that, though, is the skin is then removed and the skin itself is tested to see how much remained in the skin.

And then under the official international rules, the amount of glyphosate that passed through the membrane into that other fluid and the amount that's still retained in the skin is added together, and that gives you the amount of dermal absorption that occurred.

11:23:38

So it's really critical to understanding -- this is called a Frazier diffusion cell. It's simply, like I say, two cups with fluid, with a membrane, either rat or human skin membrane, stretched across it.

11:23:55

Q. And so if any of the thing on the skin, if any of that was -- essentially you couldn't account for it, does that happen sometimes where you just can't account for what you put on the skin?

11:24:14

A. Yes. That's called the percent recovery. So when we take what's in the cup and what's in the skin and what's on the other side of the cup, and let's say we started with 100 micrograms, when we add those three

11:24:29

numbers up we should end up with 100 micrograms.

Q. Does that always happen?

A. No.

Q. And so what do you do when you're trying to figure out how much dermal absorption, what do you do with that part you don't get back?

A. Well, what happens on many of the studies, what's measured in the cup where you put the glyphosate in is measured on the other side but the tissue itself is not tested.

So under the Federal -- well, really under EPA and even under the OECD rules -- OECD rules are an international agency that make the rules for this particular test -- if it doesn't equal 100, then it's assumed that the rest of it is stuck in the skin, and that has to be considered as absorbed.

Q. We've heard Monsanto witnesses state that the total dermal absorption of glyphosate is less than 1 percent. Do you agree with that?

A. No. I have carefully examined all of the studies that Monsanto has used from, you know, the 1980s on up to the current dates.

Q. And you reviewed those and relied on those in reaching your opinions in this case?

A. Absolutely.

Q. And you mentioned back from the 1980s. Has Monsanto been performing dermal absorption studies all the way back into the 1980s?

MR. LOMBARDI: Your Honor, this is hearsay for this witness, and pursuant to the rulings this morning, he's not able to talk about that.

MR. DICKENS: Your Honor, I simply asked whether or not they have performed these studies.

THE COURT: All right. He may answer that question.

THE WITNESS: Yes, yes. Monsanto's performed one, two -- at least eight studies.

MR. LOMBARDI: Your Honor, this is going beyond the answer to the question.

THE COURT: So do you have another question for the witness, Mr. Dickens?

MR. DICKENS: Yes.

Q. Did you rely on those studies back from the 1980s in reaching your opinion as to what the dermal absorption of Roundup or Ranger Pro is?

A. Yeah. As my primary role as a toxicologist, that's what I do, is I assess the study data and determine what the dermal absorption is. That's what I -- that's what toxicologists do.

Q. And would -- and based on your review of those

studies, you did reach an opinion with respect to what the dermal absorption for Roundup and Ranger Pro was; correct?

A. Yes.

11:27:09 Q. And would reviewing those studies assist the jury in explaining what your opinions are with respect to your opinion on dermal absorption rates?

A. I missed the last two words.

Q. Yes. Would reviewing those studies with the

11:27:23 jury -- or assist the jury in understanding what your opinion is as to the dermal absorption rates for Roundup and Ranger Pro?

A. Absolutely. It's a critical portion of this assessment as to how much was systemically absorbed into

11:27:39 Mr. Johnson's body.

Q. And are you aware of a study back in the 1980s performed by Dr. Maibach?

A. Certainly.

Q. And you reviewed that in preparation for your

11:27:53 opinions in this case?

A. Yes, I have reviewed it extensively over the past year.

Q. And you relied upon the Maibach study in forming your opinions as to what the dermal absorption rate is;

11:28:09 correct?

A. That's correct.

Q. And it's one of the key factors that you analyzed?

A. Yes.

11:28:14 Q. The Maibach study, was that a study conducted by Monsanto?

A. Yes.

Q. And what was it studying?

A. Well, there were two aspects of the study.

11:28:24 MR. LOMBARDI: It's not otherwise in evidence, your Honor.

THE COURT: Objection sustained.

MR. WISNER: Your Honor, could we have a sidebar?

11:28:32 THE COURT: Yes.

(Sidebar.)

[redacted]

11:28:56 [redacted]

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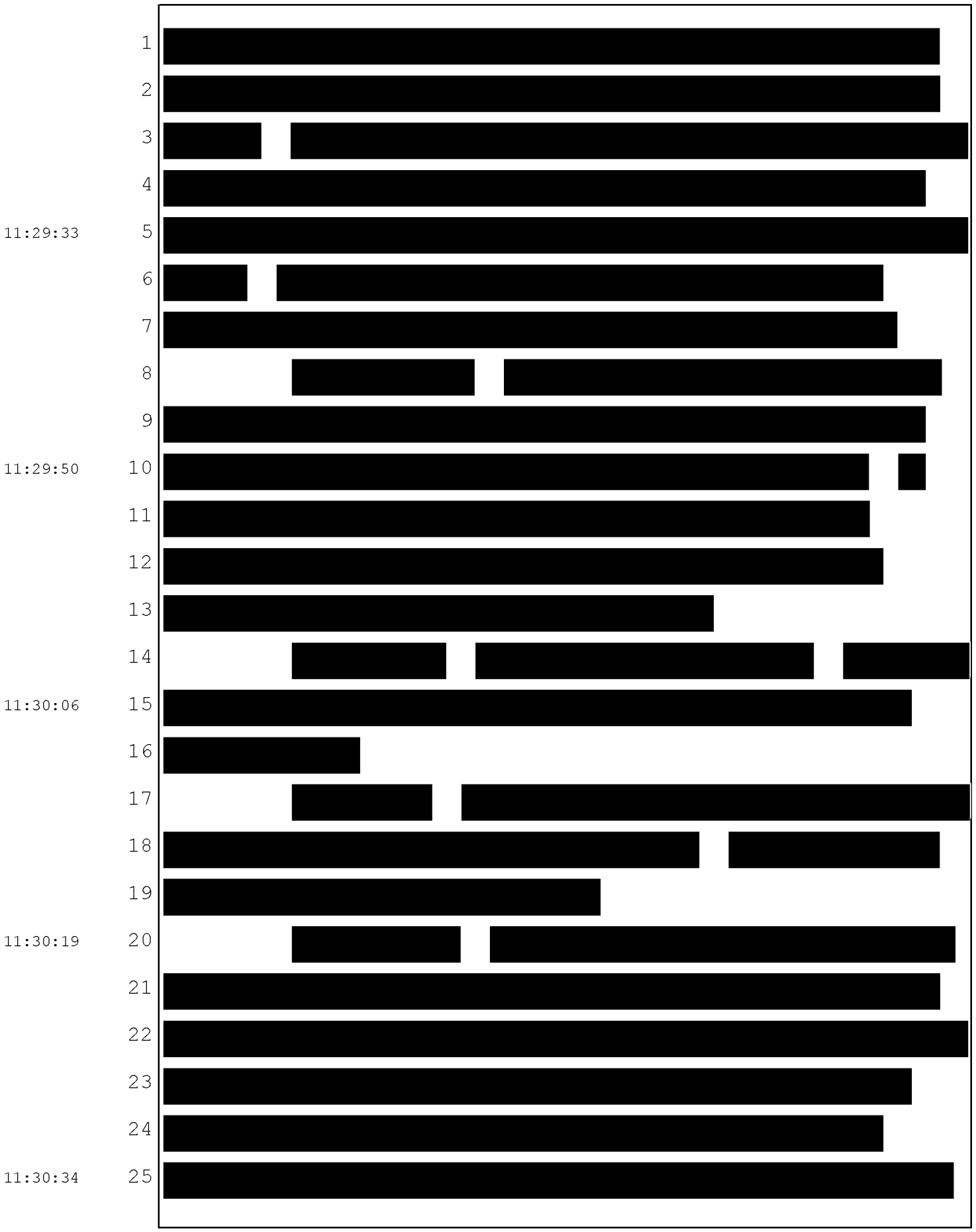
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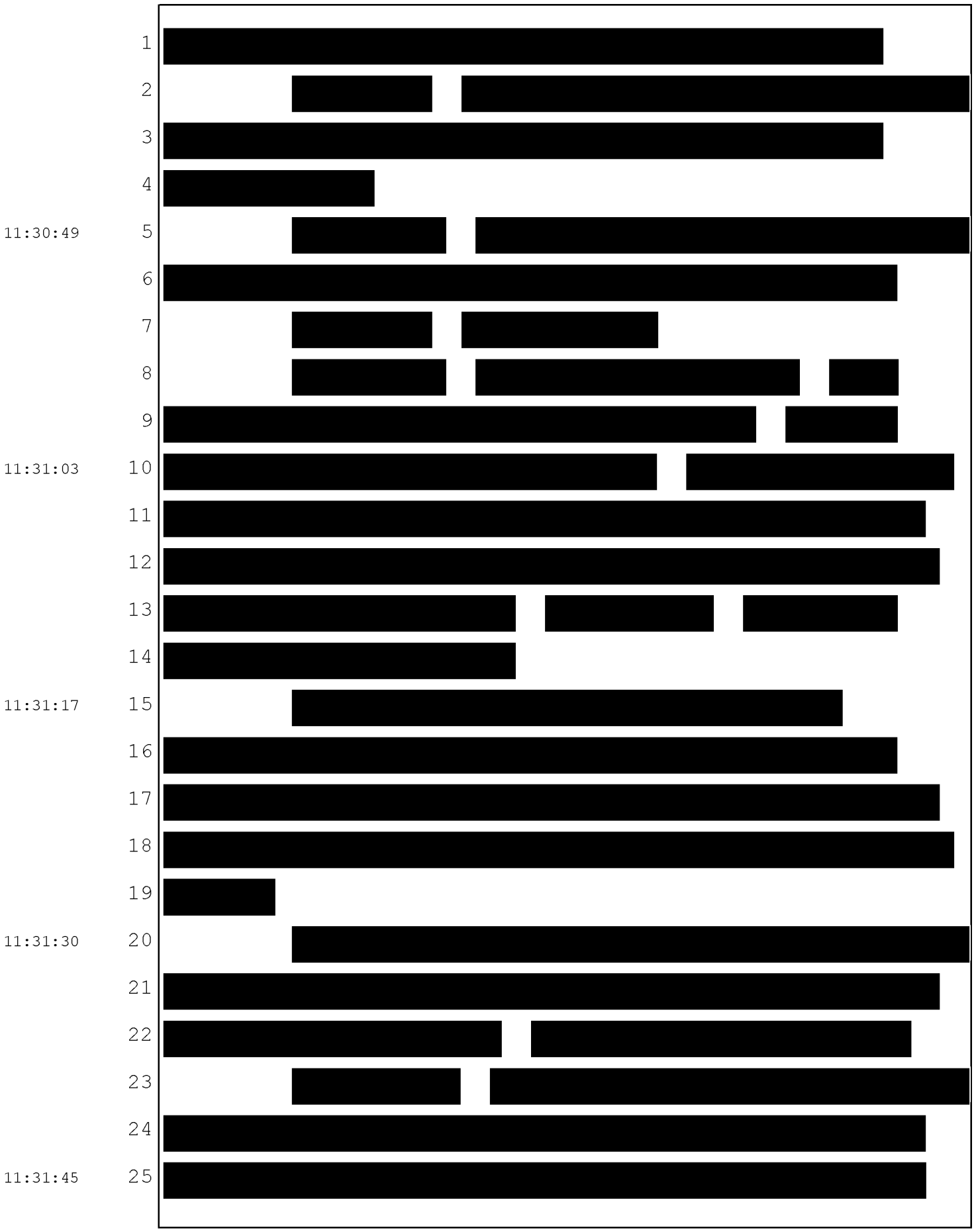
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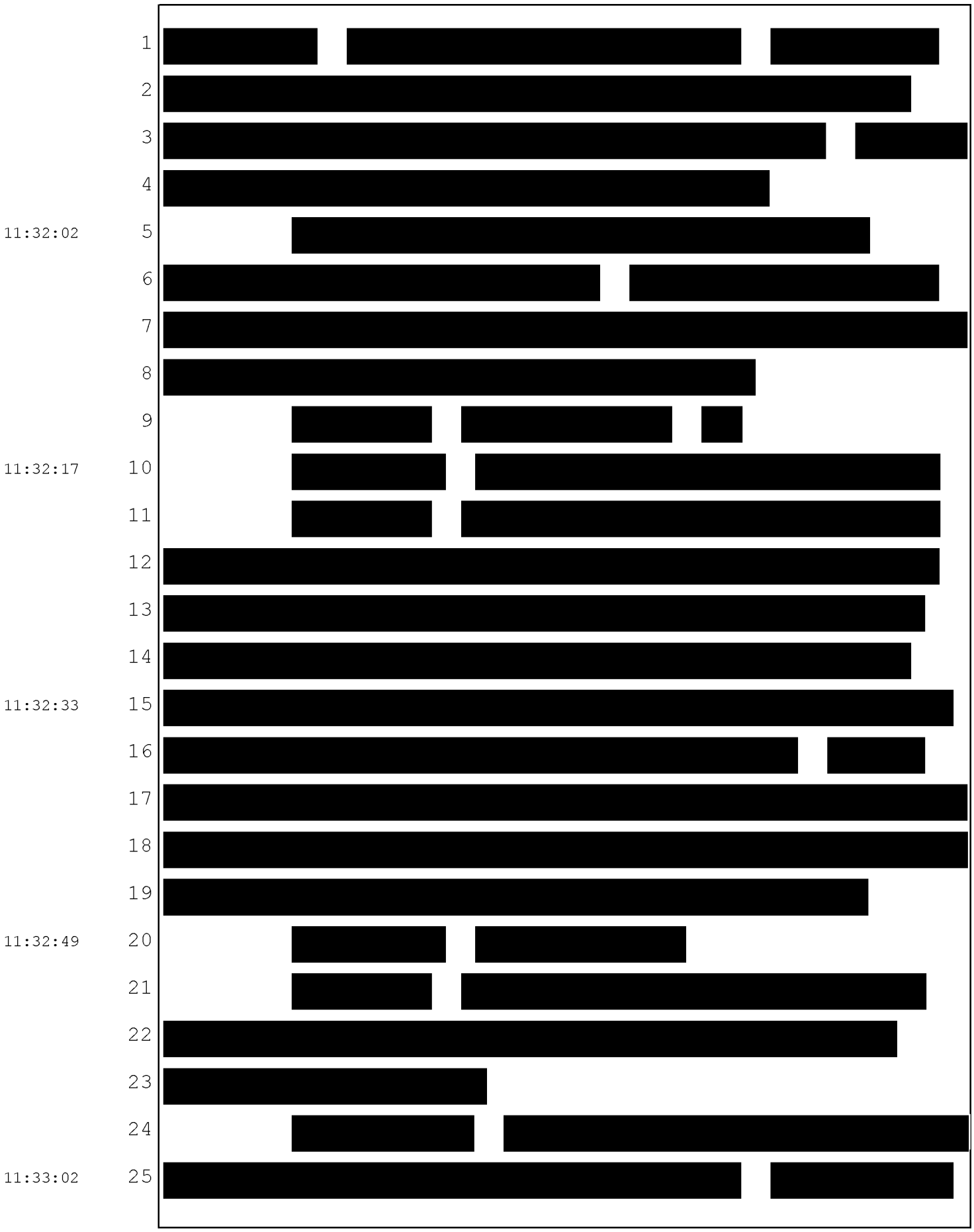
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(End sidebar.)

THE COURT: All right. Mr. Dickens, you may proceed.

MR. DICKENS: Thank you, your Honor.

Q. Dr. Sawyer, we're not allowed to discuss each of the studies you reviewed, but you have reviewed dermal

absorption studies conducted by Monsanto and others in reaching your opinion as to the dermal absorption rate; correct?

A. Yes.

11:34:38 Q. And you reached an opinion as to what the dermal absorption rate for Ranger Pro and Roundup is; correct?

A. That's correct.

Q. And what is your opinion with respect to the percentage of dermal absorption of Roundup and Ranger Pro

11:34:50 in the human skin?

A. Based upon the studies conducted by Monsanto or their contractors, 10 percent. 10 percent of the dose is absorbed systemically.

Q. Okay. And can you put that in context? What

11:35:05 does that mean, 10 percent?

A. Well, it mean that 90 percent of it can be washed off after a sustained period of time. It does not -- or 90 percent of it does not penetrate through the epidermis into the dermal area, but 10 percent does make

11:35:28 it into the skin, into the body.

Q. And what is the significance of that?

A. It's important in calculating the dose. The dose for a worker handling either a backpack sprayer or a hose, hydraulic hose unit as Mr. Johnson did, has been

11:35:50 carefully assessed in the Monsanto operator exposure

studies, and this -- when I say "carefully assessed," this is where the operators actually wear patches on their body, basically a gauze patch, different locations, back, neck, legs, shins, chest, hands, and after they've worked for six hours, these pads are removed.

11:36:15

MR. LOMBARDI: Your Honor, this is what we just spoke about. It's an improper --

THE COURT: Okay. Counsel, can you move on to a different question.

MR. DICKENS: Absolutely.

11:36:30

Q. So the 10 percent, without getting into specifics of actual studies, can you -- can you explain what -- if there's 10 percent left in the skin, does that eventually get washed off at some point in time? What happens to that 10 percent?

11:36:47

A. It is available for -- it's been assimilated by the body, and it's available as a harmful material.

Q. Once again, without getting into specific studies, are there other studies that found a smaller percentage of dermal absorption than 10 percent?

11:37:10

A. Yes.

Q. And you took those into consideration as well?

A. I did.

Q. And were you able to -- in consideration of all those studies, you still were able to reach your opinion

11:37:21

that it was 10 percent of dermal absorption?

A. Yes. I relied primarily on primate studies, which are most close to humans, and in primate studies that were -- had actual dermal application to the body, as opposed to the rat or human studies that were performed using the Franz diffusion tube with cadaver skin.

11:37:40

Q. Why did you rely more on the monkey or primate studies rather than the other one?

A. More relevant to humans, and they were live animals, and in the live organs, we have circulating capillaries blood through the capillaries, we have a live vascular system. That's certainly more realistic than using cadaver skin.

11:37:57

Q. Without talking about specifics, were all the studies on dermal absorption that you reviewed, were all of those submitted to the EPA?

A. No. They were not. Only select studies were submitted to the EPA for consideration on licensing.

11:38:19

Q. You said "only select studies." Who made those selections?

A. Monsanto.

Q. Are you aware of something known as the farm family exposure study?

A. Yes.

11:38:33

11:38:51

Q. And you reviewed that in reaching your opinions in this case?

A. Yes.

MR. DICKENS: If I can publish, your Honor, Plaintiff's Exhibit 977?

THE COURT: Any objection?

MR. LOMBARDI: No objection, your Honor.

THE COURT: Very well. You may proceed.

Q. BY MR. DICKENS: And, Doctor, this is the glyphosate biomonitoring for farmers and their families. Results from the farm family exposure study; is that right?

A. Yes.

Q. And there's a John Acquavella.

Do you see that?

A. Yes.

Q. And where does he work?

A. Monsanto Corporation.

Q. And do you know what year this was published?

A. I believe it was 2004.

Q. And so this was approximately eight years prior to Mr. Johnson using Roundup or Ranger Pro?

A. Yes.

Q. And if I can turn your attention to the first page, Doctor. It says, "The purpose of this," and I

believe that's, "farm family exposure study."

Do you see that?

A. Yes.

Q. And it says, "Quantify real-world pesticide exposures immediately before, during and after a pesticide application and to identify significant exposure determinants." Did I read that --

A. Yes.

Q. And that is your understanding as to the purpose that Monsanto conducted this study?

A. That's correct.

Q. I want to turn your attention. As we heard previously in Dr. Farmer's testimony, it states: "None of the systemic doses estimated in this study approached the US Environmental Protection Agency reference dose for glyphosate of 2 milligrams per kilogram per day."

MR. LOMBARDI: Your Honor, we had a lengthy discussion on this point yesterday.

THE COURT: Counsel, can you approach?

(Sidebar.)

[redacted]

[redacted]

(End sidebar.)

THE COURT: You may proceed, Mr. Dickens.

MR. DICKENS: Thank you, your Honor.

Q. Can I ask you, Doctor, what is the reference dose that's being referenced in this particular sentence?

A. This is a what we call RFD, risk reference dose, established by EPA to be protective specifically and only for non-carcinogenic effects, in this case birth defects. It is not designed and can never be used as a safe level for cancer. That's not what that value is designed to be protective against.

Q. Okay. So it has nothing to do with carcinogenicity at all?

A. That's correct.

Q. How did they measure real-world glyphosate or glyphosate formulation exposure in this study?

A. They had urine samples.

Q. Was it, in your opinion, an appropriate way to measure real-life exposure?

11:43:06

A. No. There's a horrible error, very serious error, with respect to measuring urine for glyphosate, that is, that when one is dermally absorbing glyphosate, it largely comes out of the feces. And by measuring urine and assuming that it all comes out in the urine gives a very erroneous result.

11:43:28

Q. Was the glyphosate in the feces measured in this study?

A. No.

Q. Why would more glyphosate be excreted in the feces rather than the urine?

11:43:43

A. Well, there are two types of studies. One study to determine the excretion route of urine is to inject an animal, IV bolus injection of glyphosate, and when that is done, about 89 percent of it comes out in urine.

11:44:04

However, one -- one takes a primate, such as a monkey, and doses that monkey dermally with the same amount of glyphosate, but rather than giving an IV push, lets it absorb over a period of hours. It comes out in the feces, largely in the feces, and that is because the

11:44:30

liver -- when it is being slowly absorbed, the liver continually metabolizes it and sends it out the bile deduct into the feces, but when it's injected intravenously, the liver is saturated. It's overloaded, and it spills out and comes out in the urine.

11:44:49

So there are two types of routes of exposure that have been used to study how glyphosate is excreted, and this study is assuming that it all comes out in urine, and it's dead wrong. It's an erroneous study.

11:45:08

Q. BY MR. DICKENS: Which of the two types of exposure would be more relevant for Mr. Johnson, the IV or the dermal exposure?

A. Certainly the dermal.

Q. Now --

11:45:17

A. The dermal excretion through the feces.

Q. And so, once again, if you're not measuring in feces in a study, you're not getting an actual real-world estimate as to exposure to applicator?

A. Correct. And in this study, assuming that

11:45:37

90 percent of it is coming out in the urine when, in fact, only 10 or 20 percent goes out in the urine, the numbers in this study are off by a factor of 5.

Q. Grossly underestimated?

A. Grossly underestimated. Yes. Much so.

11:45:52

Q. I want to turn your attention to page 3. And I

can highlight it for us.

In this study, it's -- it states: "All the farmers used tractors and boom sprayers."

First of all, what's a boom sprayer?

11:46:09 A. That sits behind the tractor, and it has multiple nozzles that sprays out in the direction from the tractor. So it's leaving a trail of aerosol behind the tractor.

Q. So I also want to turn your attention here:

11:46:27 "Most of the farmers reported having tractors with enclosed cabins."

Do you see that as well, Doctor?

A. Yes, I do.

Q. So what is your understanding of how the

11:46:39 glyphosate was being sprayed by the farmers involved in this study?

A. Well, in a much safer manner for the applicator, as opposed to Mr. Johnson who was continually -- not continually, but very commonly impacted with heavy mist

11:46:58 exposure from the hose sprayer and the various wind currents causing the drift material to directly impact his entire body.

Q. Would you expect farmers spraying from tractors in enclosed cabins to have more or less exposure than

11:47:19 Mr. Johnson?

A. Far less. And as proven in Monsanto's operator exposure risk assessment study, which I relied on in my dose calculations.

Q. Are there other factors for an applicator that would affect how much exposure they had to Roundup or Ranger Pro, other than the method of spraying?

11:47:54

A. Yes.

Q. And what are some of those other factors?

A. The amount of protective gear. For example, in the Monsanto operator exposure studies, where the individuals wore patches for testing, in that study a full faceplate was recommended. A faceplate is a shield that -- I actually have one I use with my chain saw. It's a faceplate that goes way down even below the jaw, a solid plastic faceplate. They also use water impermeable, waterproof jackets and waterproof coveralls.

11:48:16

11:48:39

So the protection that was used in that study was beyond that of Mr. Johnson, who wore impermeable clothing.

Q. And --

11:48:59

A. And no full faceplate.

Q. You say "impermeable clothing." But we've heard testimony he wore a Tyvek suit. Isn't that impermeable?

A. He wore a Tyvek 400 dust suit.

Q. Okay.

A. It's a dust suit. It keeps out particulate dust. It has open sleeves, open legs. It's not designed for aerosol, organic solvents or any type of liquids.

Q. And do you have any personal experience with the Tyvek 400 suit worn by Mr. Johnson?

11:49:32

A. Yes. I've used an OSHA-certified, OSHA 40-hour HAZMAT, several times for my own use, to be able to go on to Superfund sites, extremely dangerous sites. And I'm very familiar with the various classes of suits made by Tyvek.

11:49:54

I -- I've worn the dust suit in situations where I was being protected from heavy metals, from dust. But I would never wear a suit like that in an instance where organic chemicals were in the air. It's not designed for that. It's a dust suit.

11:50:12

Q. Did you specifically do anything to research the Tyvek 400 in reaching your opinion that Roundup or Ranger Pro could permeate that?

A. I did. I looked at the various Tyvek literature and specifications specific to the 400. It is a breathable -- it's called a breathable suit. It's designed for comfort, but yet designed to keep dust out.

11:50:26

Q. And where specifically did you go to find those specifications?

A. I looked at Tyvek's own literature.

11:50:39

Q. And you reviewed and relied on those in reaching your opinions in this case?

A. Yes. And my experience 30 years using Tyvek suits.

11:50:51 MR. DICKENS: Your Honor, at this time I'll move to publish Plaintiff's Exhibit 118.

THE COURT: Any objection?

MR. LOMBARDI: No objection, your Honor.

THE COURT: Okay. You may proceeded.

11:51:09 Q. BY MR. DICKENS: Now, Doctor, is this the document that you reviewed with respect to the DuPont safety specifications for the Tyvek 400?

A. Yes.

Q. And, once again, you pulled this directly from

11:51:21 DuPont themselves?

A. Yes.

Q. Is it your understanding that DuPont's the manufacturer of this particular suit?

A. That's correct.

11:51:30 Q. Doctor, it says, "Tyvek 400 fabric offers inherent barrier against particles down to 1.0 micron in size."

Do you see that?

A. Yeah, that's correct. It's designed to keep out

11:51:47 dust particulate. But yet designed for comfort. As we

see here, "Comfort fit design based on the wearer input to provide our most comfortable garment."

It allows moisture to go in and out. So you -- so you don't basically turn into a horrible, overheated, sweaty mess, which happens when one wears the more sophisticated suits, which I've worn many times.

Q. So there's different types of Tyvek?

A. Yes.

Q. And you wear them in different situations?

A. Correct.

Q. This one you referenced as a dust suit. Are there some that wouldn't be permeable to liquids?

A. There are suits that are completely impermeable to organic solvents, liquids, glyphosate, water, yes.

Q. Well, which suit does the Roundup or Ranger Pro product labeling instruct its -- its users to use?

A. The actual label from Roundup and Ranger Pro does not require any suit. It's rather strange. When they ran their own operator exposure study, they recommended waterproof jacket, pants, faceplate, et cetera. But none of that is on the warning of Roundup that was used by Mr. Johnson.

Q. Well, it protects against particles down to 1.0 micron in size. With the Roundup and Ranger Pro Mr. Johnson was spraying, was that -- would that have

permeated? Is it of the sufficient size?

A. No. It's not designed as a water or solvent-proof suit. It's the wrong suit for the -- it's not the right suit for the job. Let's put it that way.

11:53:31 This is the suit that's designed -- for example, spreading the talc material on the baseball field. This would be a great suit for keeping the talc dust off Mr. Johnson. But it's not the right suit for spraying Roundup.

11:53:47 Q. Okay. I'm going to turn your attention to page 3 of this document. And it actually has "Herbicides." And it says, "General." Then it says, "Solid form."

Do you see that?

11:54:00 A. Certainly. In a solid form, it would be acceptable. The solid form means particles. And particles of herbicide are generally greater than 1 micron in size, and they would not make it through the pores.

11:54:13 Q. Okay. And there is solid herbicides sold out there?

A. Oh, absolutely. Yeah. You can put them in these lawn spreaders, for example, that you push.

Q. Now, some of these other examples actually say

11:54:28 it's, you know, suitable for use for liquid.

Do you see that, Doctor?

A. Yes, I see that.

Q. But there's no mention of it being suitable for herbicides that are liquid like Roundup or Ranger Pro; is that right?

11:54:46

A. Correct.

Q. And, once again, Monsanto's labeling doesn't warn you or tell you to wear any type of Tyvek or other permeable suit, does it?

A. That's correct.

11:54:57

Q. And so Mr. Johnson, even though he was wearing, you know, this Tyvek suit, that was above and beyond the labeling requirements?

A. That's correct.

Q. But, you know, it wasn't keeping him completely protected from the Roundup and Ranger Pro that he was spraying?

11:55:08

A. No. It did very little.

Q. With respect to Mr. Johnson's spraying, do you have an understanding how he was spraying the Roundup and Ranger Pro?

11:55:34

A. Yes.

Q. Okay. And what is your understanding of the different manners in which he would spray?

A. Primarily he was using a large hydraulic nozzle

11:55:45

hose, which was connected to a hose reel, which was connected to a pressurized pump, and then a 50-gallon reservoir tank on the truck.

And he was able to reel out the hose line and walk around and spray with it. It was an uncontrolled pressure. In other words, he couldn't turn the pressure down or up. It was either on or off.

Q. And you mentioned aerosol earlier today. Was his type of spraying, would that create an aerosol?

A. Yes. He was using a -- interchangeable colored spray heads consistent with that used in pressure washers.

Q. Have you ever used spray heads similar to that?

A. Yes. I have a pressure washer I use on my boat.

Q. Okay. So Mr. Johnson, unlike the way you did it with a long hose that you modified, was actually using a pressure hose gun, essentially?

A. Yes.

Q. Is that a type of spray that you would expect to be smaller or greater than the way in which you do it?

A. Well, a pressure washer nozzle produces a huge aerosol. If you've ever used one, just one trigger would literally fill this courtroom with mist. I mean, it's not -- not the right nozzle for application by any means.

Q. Based on your review of the materials, was

Monsanto aware that Roundup or Ranger Pro was being sprayed in this manner?

MR. LOMBARDI: Objection, your Honor. Same objection we've discussed before.

11:57:34 THE COURT: Sustained. Sustained.

Please ask a different question.

Q. BY MR. DICKENS: Was there anything in the product labeling for Roundup or Ranger Pro that suggested that you should not spray in the manner Mr. Johnson was

11:57:49 for his job at Benicia School District?

A. No.

Q. Are you aware of any warnings from Monsanto whatsoever suggesting that this was an inappropriate way to spray Roundup or Ranger Pro?

11:58:02 A. No.

THE COURT: Mr. Dickens, is this a good time to break for the lunch recess?

MR. DICKENS: It is, your Honor.

THE COURT: Okay. Ladies and Gentlemen, we're

11:58:23 going to break now for the lunch recess. We'll be in recess until 1:30. Please remember: Do not discuss the case, do not do any research. And we'll resume again at 1:30.

(Time Noted: 11:58 p.m.)

11:58:39

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 26th, 2018.

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Leslie Rockwood Rosas
Certified Shorthand Reporter
State of California
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